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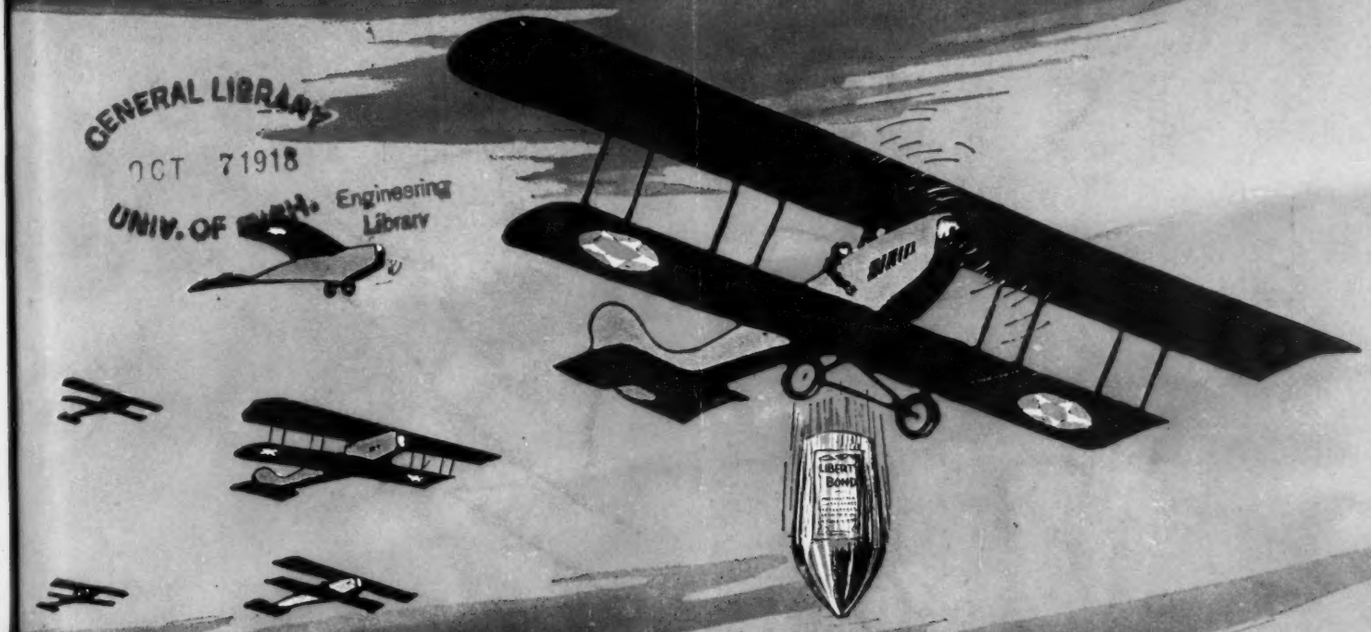

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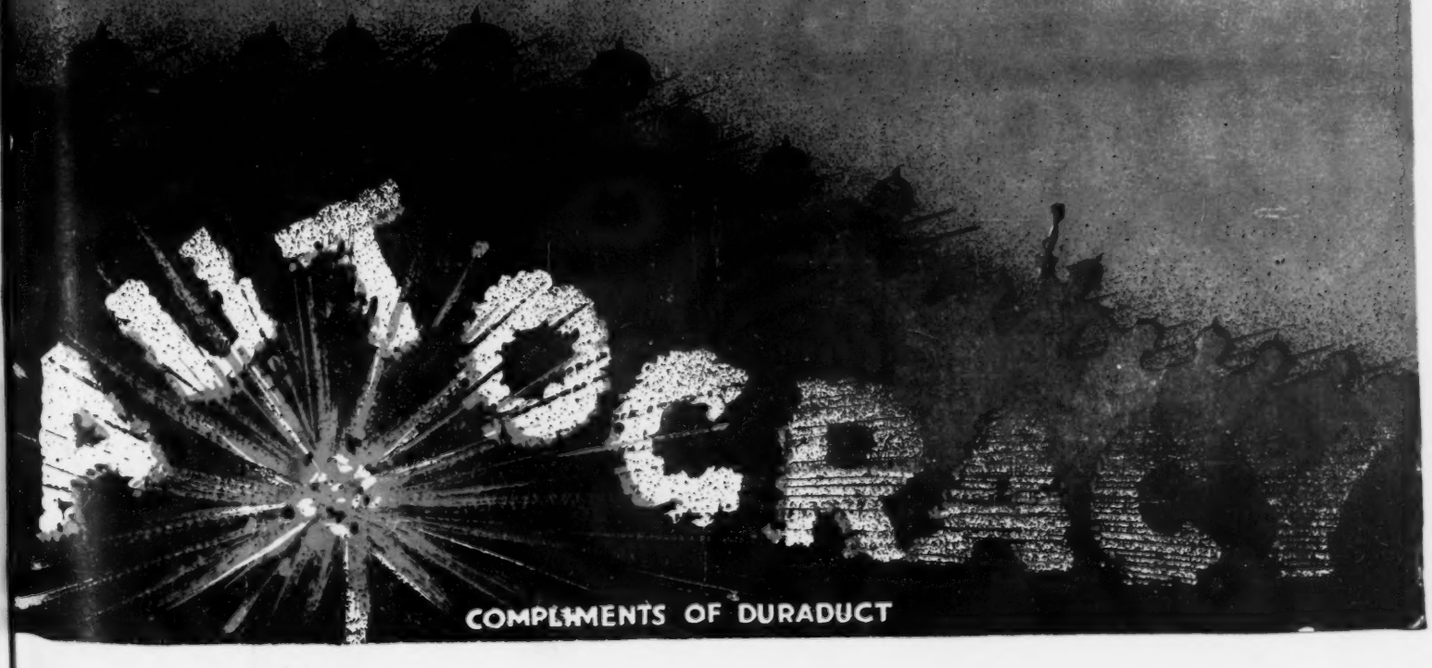

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Electrical World

F. M. FEIKER, *Editorial Director* W. H. ONKEN, JR., *Editor*

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Contents

Editorials 633

War Instruction at Massachusetts "Tech" 636
Instruction and Research Work Have Developed Rapidly Into Necessary Activities of Military, Naval and Aeronautical Character—Establishment of Unit of the Student Army Training Corps.

Preventing Interruption of Production 639
By Sydney Fisher.
Continuous Supply of Motive Power Imperative in These Times—What Can Be Done in Selecting and Inspecting Electrical Equipment to Assure Its Uninterrupted Maintenance?

Outdoor Distribution Substations in War Times 642
By R. E. Cunningham.
Three-Phase Transformers with Automatic Pole-Top Oil Switches in Primary—An Innovation Found Suitable Under Certain Conditions.

Reconstruction of a Two-Phase Station—I 644
How Some Problems Made Necessary by Rapid Load Developments Were Handled by an Iowa Company—Description of the Furnace Equipment and the Efficiency Instruments Installed in the Plant.

Central Station July Operations 647
Based on the Returns from 48 per Cent of the Industry, the Electrical World Estimate for July for the Entire Industry Is: Revenue, $37,658,000; output, 2,362,800,000 Kw.-hr.

Station and Operating Practice 648
Large Electric Crane Used by American Navy—Watt-hour Meters Tested at District Repair Shops—Electrolytic Plant Favors Use of Smooth Commutators—Safety of Grounded Secondary Connection.

Central Station Service 650

Technical Theory and Practice 652

News of the Industry 655

Associations and Societies 655

Commission Rulings 655

Current News Notes 666

Recent Court Decisions 666

Men of the Industry 667

Trade and Market Conditions 668

Current Prices of Electrical Supplies 672

New Apparatus and Appliances 674

Trade Notes 676

Trade Publications 676

New Incorporations 676

Construction News 677

Directory of Electrical Associations 679

Record of Electrical Patents 680

Advertising Indexes—Alphabetical, 141; Classified, 137-139; Searchlight Section, 38-61

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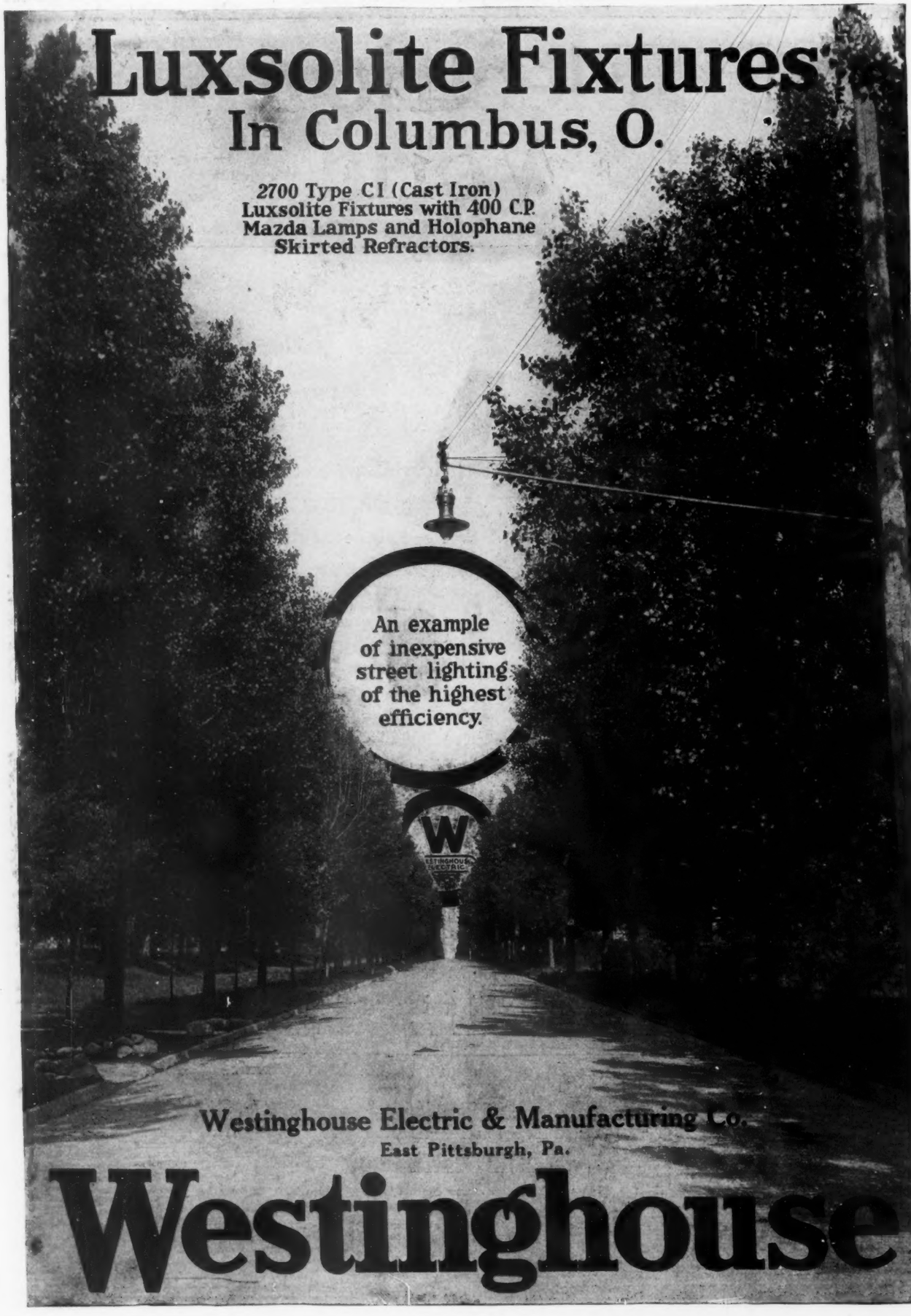
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Electrical World

The consolidation of ELECTRICAL WORLD, ELECTRICAL ENGINEER *and* AMERICAN ELECTRICIAN

Volume 72 New York, Saturday, October 5, 1918 *Number* 14

The Situation Regarding Coal

COLD weather brings with it fuel problems. The position of public utilities as regards coal supplies is not so very serious as it was last year, thanks to the warnings of the Fuel Administration and the engineering press, yet it is nevertheless serious. Managers of public utilities have still a real cause for anxiety this coming winter, because we need more coal than ever and the mining and transportation questions are by no means settled. It therefore behooves all to practice more rigorous economy in the use of coal. We must get every heat unit out of it with a minimum expenditure of labor and make what we get go as far as possible. By using efficient equipment, improving load factors and power factors, stopping leaks and checking waste, we can help both the nation and ourselves. It is an excellent thing to have faith in ourselves and our industry and not to rely too much on other agencies. We may have a mild winter and we may not. Our transportation lines under government control may be equal to all emergencies and they may not. Anyway, it is better not to trust too much to them or to the weather. Works are what count, and right now every one should take a personal and patriotic interest in saving as much coal as possible. We can never become too efficient in the use of coal, and most of us are a long way from even the shadow of it.

We have gone into this war with clean hearts and hands. The cause is righteous and our men are fighting for it valiantly. Neither must suffer for lack of support. LEND!

Distributing Teachers of Radio

ACCORDING to reports received recently from the Division of Engineering, United States Employment Service, there is at present a great demand for teachers of radio-telegraphy. The need is particularly great in many important colleges now giving military courses to young men who are in the draft or are enlisted in some reserve corps. That such a demand exists and that it is not being adequately filled is regrettable, for instruction in this subject is highly important. It has been suggested that the whole demand may be easily filled if a suitable arrangement can be made with the army authorities. The army schools are regularly turning out men who have finished the regulation courses in radio-telegraphy and who are in many cases especially well qualified to teach it. If these men could be furloughed for a brief period and sent as instructors to the various universities and schools where military courses are being given, they could do a great deal of good in a direct way. With hundreds of men thoroughly trained in radio-telegraphy, it is regrettable to have universities begging in vain for one or two teachers.

There can be only two outcomes to the war—victory or defeat. The latter is unthinkable and victory cannot be effected without funds. Help us win by buying bonds.

Study of the Tariff Is Needed

STUDY of the tariff, systematic planning for the future, is necessary for the electrical manufacturer who hopes to maintain his position in after-the-war competition. Study and planning is not by any means all that the manufacturer needs to do, but it is the first step to assure sympathetic public and governmental recognition of his just requirements in this direction. Without preliminary and intensive study there cannot be a convincing presentation to the government of the grounds on which Congressional tariff action can logically be based. The electrical manufacturing industry as an industry, making its claims as a welded whole, has to-day an opportunity which, if neglected, may not be open for years again, may in truth never appear. We are at war, but we should not fail to look far enough ahead to avoid pitfalls, to see and follow the straight clear road toward greater volume of production. For many years the tariff has been the abused football of the two main political parties. Within the boundaries of high or low tariff, however, electrical manufacturers asserted occasionally their desire for equitable treatment.

No thinking man will deny that there has been entirely too much politics in the tariff in the past, too little real scientific consideration. Costs here as compared with costs abroad, markets, labor, raw materials, not carefully appraised in years gone by in their relation to the electric industry, are now awaiting the study of the men in the industry, who can render a service of permanent value to it. The United States Tariff Commission asks full revelation of the truth—in fact, urges it. Little understood by the general public or the law makers, dealing with a force mysterious to them, the electrical industry now at last has the official invitation to make its case plain to the commission, to make such an investigation as has not been made heretofore in the history of the country.

The international trade committee of the Associated Manufacturers of Electrical Supplies in its search for data to lay before the Washington authorities has undertaken a work which is of constructive and great

importance. It is much handicapped by the war conditions and the additional pressure which the national demands put upon the staffs of the manufacturing companies. Nevertheless, its requests for data should be met and met promptly. Large results depend upon the success of its work; serious penalties will be paid if the United States adopts a tariff policy which fails to deal adequately with the electrical manufacturing industry. Certainly, the Tariff Commission, seeking a scientific basis of fact for its recommendations to Congress, has a right to expect the coöperation which it asks. Giving the coöperation, the manufacturers have every reason to urge with confident assurance that they shall have a separate classification in the new tariff schedule. The present powerful position of the industry warrants it, the hope and expectation of tremendous growth in coming years demand it. Other countries, far more deeply embedded in war than are we at this time, are proceeding to formulate programs for after-the-war foreign trade. We should not, to say the least, be behind them in outlining a positive course or, after it is outlined, in following it with zeal.

The blood of Americans is being shed abroad so that liberty and justice may prevail throughout the world. This sacrifice will be in vain unless the nation has the funds to finish what it has undertaken. Liberty bonds help.

An Important Interconnection System

A PLAN for exchange of power between the Boston Edison company and the New England Power Company is just now in process of execution. It unites the two biggest networks in New England to the benefit of both the participating companies and the public. This interconnection is a little out of the usual in that for the present it is a case of a steam plant coming to the rescue of an overburdened hydroelectric system, instead of the reverse. The Boston Edison company has a thoroughly efficient and well-organized plant on tidewater and covers between 400 and 500 square miles of territory with its right-of-way and pole lines. It is already heavily loaded at the peak, but like other plants doing a general electrical supply business has spare capacity for a part of the twenty-four hours.

The New England Power Company has a far-reaching network and does a business chiefly of wholesaling power in large blocks. It obtains electricity from the Connecticut and its confluents, the original plant being in South Vernon, Vt., close to the Massachusetts line. Now the Connecticut River is subject to periods of extremely low water, and despite the interconnections with steam plants of considerable reserve capacity, the company's business, now including a very large proportion of war industries, has grown to a point perilously near its feasible output. Under these circumstances a coöperative arrangement with the great steam plant in Boston was extremely desirable. The power thus made available for most of the day is a very valuable resource otherwise not immediately useful to any one. On the other hand, there are times of the day and year when the hydroelectric plant is able to return energy to its neighbor if needed. The vast extent of the whole system and its varied uses insure a considerable diversity factor and hence a better utilization of the aggregate of generating plant. The steam plant will, besides, definitely gain in the increase of load during hours off the peak, which will react favorably on generating costs. The whole situation is one in which the value of interconnection can be clearly demonstrated, and it is a matter for general congratulation that interconnection is to be at once provided.

The battle of Marengo was won by Napoleon because a drummer boy only knew how to beat a charge. If we only knew how to lend, there would be no doubt as to the outcome of this war.

More About Industrial Motors

SYDNEY FISHER'S paper on the equipment of industrial plants deals particularly with problems of motor rating. It is undoubtedly true that the average engineer plays for safety and is likely to overburden the plant with underloaded motors rather than to take any chances. The result is often a combination of low efficiency and low power factor which is a serious handicap. The ordinary induction motor is a remarkably efficient and reliable machine, all things considered, but it does not do its best on half load. Just now, when motor deliveries are poor, it is particularly undesirable to demand unnecessary capacity, to say nothing of paying for it in lowered efficiency. From this viewpoint Mr. Fisher has a fling at the limitations of individual drive. As our readers well know, the tendency of late has been strongly in the direction of machines directly motor-driven. There are obvious reasons for this in the added flexibility of the drive and, under favorable conditions, in the gain of efficiency by cutting out shafts and belting. Yet, as Mr. Fisher points out, a well-planned group drive may, through the diversity factor of its load, work at a rating giving considerably higher efficiency and power factor than with individual drives for the same machines.

Something here depends on the absolute as well as the relative size of the units. An induction motor of a single horsepower or a little more usually shows both rather low efficiency and rather low power factor even at full load, particularly if of moderate speed. The loss thus incurred may well be in the long run quite comparable to that from the well-planned shafting and belting of a group drive, to say nothing of the difference in the first cost. Hence each case should be carefully examined from the standpoint of economies, despite the familiar good points of the individual drive.

Mr. Fisher properly lays great stress on systematic experiments in the choice of motors and on rigorous upkeep. This implies sharp inspection not only of the motors themselves but of the controlling devices and of the whole drive. Of these three the two latter are likely to be the seat of the major part of the trouble. In case of a breakdown there should be a systematic scheme of trouble hunting planned to run down the difficulty in a thorough and orderly manner. One may sometimes see the cause at once or scent it by a sort of intuition, yet a regular program of examination will on the average save time—and time is money. With group drive immunity from breakdown may sometimes be had by using a pair of motors per group with an emergency belt connection and trusting to overload, which is no mean reliance in induction motors.

Motors in Paper and Pulp Mills

WITHIN the last twenty years there has been a very rapid increase in the applications of electric drive to paper and pulp manufacture. The general advantages of this are of much the same order as in other motor work—cheapness, convenience, simplicity and the like. Paper and pulp manufacture, however, requires some special adaptations of a somewhat unusual character and embodies as well a great diversity of conditions which make the choice of motors of unusual importance.

It therefore appears that a good bit of skill is necessary in picking out the motor equipment for the various items of the load. Here as elsewhere the induction motor is chiefly used, except for driving the calenders, where speed requirements interfere. A large part of the work in the general case can be accomplished with the ordinary squirrel-cage type of motor, which is cheap, efficient and rugged. There are, however, a good many machines in the pulp industry which demand special provisions for starting on account of the heavy loads dealt with at times. The squirrel-cage motor, when called upon to exert stiff starting torque, requires inconveniently high line currents, and where the starting load is exceptionally large the engineer is usually driven back upon the induction motor with a wound rotor and starting resistance. The familiar internal-resistance rotor here comes into play on account of its great starting powers, but it gives at bottom a constant-speed motor, since the resistances are intended merely for getting the necessary torque without too much current. In certain cases, particularly of group drive, when heavy machinery has to be started it is applicable with particular advantage; but there are, on the other hand, a good many cases in pulp mills where external starting resistances practically amounting to rheostatic control are necessary. Such instances are found where heavy torque is required, applied at will and in variable amount, to work the loaded machinery up to its speed. At this point it is necessary to note that such a motor has essentially the characteristics of a series-wound direct-current motor with rheostatic control. There are similar energy losses when running at reduced speed and similar tendencies for speed to vary under varying load for any particular setting of the rheostat.

For some few machines requiring rather large power even synchronous motors may be advantageously employed to do the work and improve the power factor at the same time. The voltage for large motors is sometimes the ordinary primary standard of 2300, more frequently 440 or 550 volts. In this connection it should be noted that in a paper or pulp mill motors and wiring are exposed in considerable degree to the general dampness, and proper caution in behalf of the employees would suggest that alternating currents as high as 440 volts are rather unsafe neighbors. Extra pains should be taken in the insulation of circuits and in getting both them and the motors as far out of the workmen's reach as is practicable. In certain cases, particularly with calenders, variable speed combined with constant speed under moderate variations of load is necessary. Certainly few classes of manufacture require so great variety of motors as the paper industry or demand more good engineering judgment.

To invest in the Fourth Liberty Loan is to perform a war service of the first magnitude. Financial support is as necessary to victory as military equipment. The two go hand in hand; therefore buy Liberty Bonds.

Extension of Outdoor Equipment

ANOTHER useful innovation in transmission service has come from the Pacific Coast, as so often happens. R. E. Cunningham's brief description of the application of automatic pole-top switches for transformer service gives a most useful hint to the engineers who in war-time stress have to find a way to keep up efficient service while keeping down cost. For general service it is easy enough to obtain the transformer equipment, but hitherto protective devices for small outdoor installations have been in a rather rudimentary state of development. High-voltage fuses have often proved disappointing, especially on three-phase circuits, where a single fuse might let go, throwing the motor on single-phase and very possibly burning it out.

To meet the needs of practical service there has been evolved for the Southern California Edison Company an automatic cut-out for pole-top use on circuits up to 10,000 volts. The switch is in a single tank and is fitted with three overload coils in series with the lines so that an overload on any one will disconnect the service. The cut-out can be reset by pull cables from the ground, so that a mere transient overload can quickly be dealt with. As some 200 of these switches are now giving satisfactory service, the apparatus has already passed the experimental stage, and it is in fact in regular use for transformers up to 100 kw. The cut-out can be placed on any convenient pole carrying the primary circuit to the service; thus there is no burdening of the poles with apparatus, and one hardly realizes that a real outdoor substation is in operation. The equipment is decidedly a move in the right direction—toward that simplicity in the distribution of energy at high voltage which brings good service at low cost.

We shall very probably see the same plan tried out at voltages considerably in excess of 10,000 with similar good results.

The Coming Issues

CONTINUING its discussion of electric service rates, the ELECTRICAL WORLD will present in an early issue opinions of several central-station executives on this subject. Features of a plant which was specially equipped to weather any probable contingencies that might arise as a result of the war will also be described shortly. In addition to the various problems mentioned in last week's issue, we will publish a report by Dr. Charles R. Mann on engineering education. In this report he does not propose a standard curriculum but a method by which engineering colleges can construct courses to meet present-day engineering demands. Every reader will find something in the ELECTRICAL WORLD that will apply to his own specific problems or will have some very close bearing thereon.

War Instruction at Massachusetts "Tech"

Instruction and Research Work Have Developed Rapidly Into Necessary Activities of Military, Naval and Aeronautical Character—Establishment of Unit of the Student Army Training Corps

The application of engineering educational resources to the national purpose in the war is illustrated most effectively by this account of the activities at the Massachusetts Institute of Technology.

SINCE the outbreak of the World War the instruction and research work carried on at the Massachusetts Institute of Technology, at Cambridge, one of the largest engineering schools in the world, have developed more and more into military, naval and aëronautical activities. The War Department has recently announced its intention of establishing a unit of the Student Army Training Corps at the institute, and since Oct. 1, 1918, the institute has been carrying on its work according to a program that will virtually make it continuous throughout the year for the duration of the war.

The war work of the institute has been outlined in a former issue of the ELECTRICAL WORLD, but comparatively little publicity has been given to the electrical laboratories in the plant at Cambridge, which was dedicated about two years ago and which is now thoroughly established in its new home. It is of interest at this time to touch upon some of the facilities which are now available.

The Cambridge buildings of the institute represent, with site, an investment of over $7,000,000. They face the Charles River Esplanade, and with the exception of an aperture of 354 ft. in that direction inclose a court area of about 5.5 acres. The units form a continuous building separated by fire walls into appropriate sections, three-story and four-story structures being used. In the center is an administration building and library, surmounted by a reinforced-concrete dome 72 ft. in diameter and rising to a height of 65 ft. above the top floor. The library is lighted by thirty-two 300-watt gas-filled lamps mounted in prismatic reflectors in the dome.

THE ELECTRICAL POWER PLANT

The electrical energy used at the institute is generated in a power plant containing three turbo-alternators of 187, 625 and 937.5 kva. rating respectively. The boiler installation is rated at about 1800 hp. The alternators supply the bulk of the power used and feed into 2300-volt, three-phase, 60-cycle buses. In addition to the above machines there is a turbine-driven 150-kw., 230-volt direct-current generator feeding into a 230-volt direct-current generator which feeds the 230-volt buses. This bus is also fed by two 150-kw. motor-generators run off the 2300-volt system.

Feeders from the 2300-volt buses in the generating plant are run to a distribution station in the basement of the central building directly under the dome. At this point transformers are installed to furnish the lower-voltage energy required in various parts of the institute for motor operation and alternating-current night and general lighting, laboratory outlets, etc. A special substation is provided for the electrical engineering department. A 2300-volt feeder is also run from the power plant to various laboratories where electric furnaces are used. From the 230-volt direct-current buses in the power station three main feeders run to the distributing station. These supply power to certain direct-current motors, fans, chemical and physical laboratories and electrical engineering laboratories. In order to enable sufficiently steady power to be delivered to the electrical engineering laboratory it was decided not to depend upon the 230-volt alternating and direct-current energy received from the plant of the institute through direct feeders, voltage variations and phase unbalancings due to other loads making the conditions unsatisfactory for experimental work. Hence a special substation was designed and installed for the electrical engineering department.

ELECTRICAL LABORATORY EQUIPMENT

The electrical engineering laboratories are provided with unusually complete facilities for departmental control of energy for educational purposes. Primary three-phase, 60-cycle energy at 2300 volts is brought underground to the departmental switchboard. At this point is a local plant for the transformation of energy. The output at the switchboard at this plant is direct current at 110-220 volts, alternating current in all required combinations of two-phase and three-phase energy, 25-cycle and 60-cycle supply at 110-227 volts and 155-220 volts. Three motor-generator sets supply the electrical engineering laboratories with energy. These have a rated capacity of 500 kw., one being driven by an induction motor and the other two by synchronous motors. One machine is arranged to supply single-phase and two-phase energy to the laboratories. By using the third motor-generator set for single-phase supply the second set may be used exclusively for balanced three-phase loads. The motors of these sets are remotely controlled from the departmental switchboard. Tirrill regulators are installed to control the voltage of the generators in these sets. A storage battery is also installed for use in special tests where extreme constancy of voltage is needed.

The dynamo laboratory is arranged on an industrial model, with a main floor at the ground level and a central two-story crane well with a loading platform at each end and a balcony at the first-floor level. The main floor has an area of 8000 sq.ft. and is used for motors and generators above 2 kw. in rating. The balcony is reserved for the smaller dynamos and transformers. A 10-ton crane serves the laboratory. All the instruments used in laboratory testing are stored in an instrument room opening into the dynamo laboratory on the main floor. A dumbwaiter connects this room with the balcony, an electrical measurements laboratory and calibration room. A heavy-current laboratory is available on the ground floor for service up to 6000 amp., direct current.

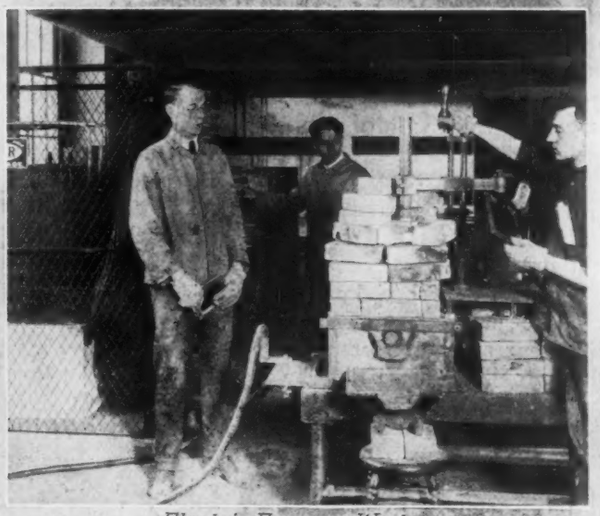
The electrical measurements laboratory is supplied

LABORATORIES IN MASSACHUSETTS "TECH" DEVOTED TO WAR WORK

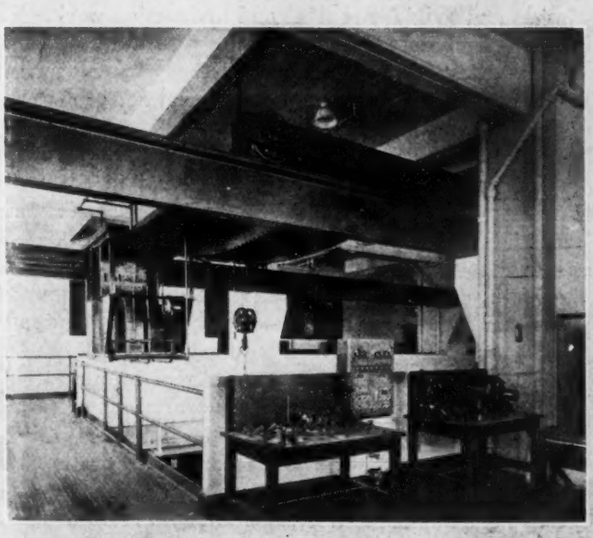
Dynamo Laboratory

Typical Storage Battery Room

Chemical Laboratory



Electric Furnace Work



Balcony in Dynamo Laboratory

Dynamo Laboratory and Balcony

with energy by special feeders running directly from the departmental substation. By throw-over switches these feeders may be connected either to the motor-generator sets in the substation or to the power house supply. In the laboratory these feeders terminate at three main distributing panels equipped with switches, fuses and circuit breakers.

The following service is available at these panels: Direct current, 230-115 volts; direct current from storage battery, 240-120 volts; alternating current, three-phase, 60 cycles, 230-115 volts, four-wire; alternating current. two-phase, 60 cycles, 230-115 volts, five-wire; alternating current, three-phase, 24 cycles, 230 volts, three-wire. The main distributing panels connect with twenty-five supply panels at convenient points. Most of these panels are mounted around the walls, but four are on standards in the middle of the room for supplying the tables used in meter testing and similar work. Individual tables are provided for the experimental work, giving a flexible arrangement and freedom from jarring. The building construction is sufficiently massive to enable the galvanometers to be supported on the walls. To facilitate the setting up of galvanometers, hoods, lamps, etc., lengths of 2-in. by 4-in. (5-cm. by 10-cm.) studding, placed 21 in. (53.3 cm.) apart and fastened directly to the walls by bolts set in the concrete at the time of molding the concrete, were provided. The entire laboratory is provided with this studding. Between every two tables 115-volt wall outlets are provided, to which galvanometer lamps may be plugged. Central tables are provided for the heavier commercial instrument tests, with lamp banks and selective load switches conveniently placed.

At one table a special panel is installed which controls a phase-shifting motor-generator set consisting of a direct-current motor connected to two 1-kw., three-phase alternators. It is possible by means of a small motor provided with a remote-control arrangement to shift the stator of one alternator with respect to that of the other and thus obtain any desired power factor, lagging or leading. The range of frequency is from 18 cycles to 75 cycles. By means of specially designed field rheostats the voltage of these machines may be varied in small steps from zero to 300 volts.

WIDE VOLTAGE AND CURRENT RANGE PROVIDED

The laboratory is also equipped with a special low-voltage, high-current storage battery and a step-down transformer of high current rating, so that it is possible to obtain 2-volt storage battery currents up to 2000 amp. and 5-volt alternating current up to 5000 amp. By means of control equipment and series-parallel connections wide ranges of voltages and currents may be secured. A battery-charging motor-generator set is available for laboratory supply, in addition, for currents up to 150 amp. at 8 volts. Other rooms include a set-up room for preliminary investigations, which can be conducted without interfering with the regular work of the laboratory and independent of its apparatus arrangements; a calibrating room and a dark room used mainly in the development of oscillographic films and for printing.

A high-potential laboratory is adjacent to the laboratory of electrical measurements. This is equipped with a 15-kw., 230/100,000-volt transformer surrounded by a protective casing. Two high-potential busbars of iron pipe are suspended from the ceiling by suspension insulators of four units each. These buses run the length of the room and make it possible to distribute the high potential to other parts of the laboratory as desired. Another piece of equipment is a 15-kw., 50,000-volt transformer having voltmeter coils in its high-tension winding. These coils enable the high-tension voltage to be measured without recourse to multipliers or to potential transformers. The power used in this laboratory for testing service is derived from a 20-kva., three-phase alternator driven by a direct-current motor. The alternator is specially designed to give virtually a sine wave under all conditions of load. Beneath the floor an iron tank is provided for immersion tests, with water and steam supply for temperature regulation.

PHOTOMETRIC AND OTHER RESEARCH LABORATORIES

Other laboratories include photometric research and general research laboratories, a transmission laboratory with artificial lines for investigation purposes, all of which are wired for varied types of electrical service and equipped as pending researches demand. In general, the laboratories associated with the different institute departments are provided with an elaborate variety of service, electrical, steam, gas, air and hydraulic. Classrooms, lecture rooms and thesis rooms are also wired and piped for the most complete service, including in some cases control apparatus specially mounted according to the local needs, portable experimental tables run on wheels and tracks leading from preparation rooms to the lecture halls, pillars arranged to supply direct and alternating current, gas, air, etc., at diverse pressures, blackboard outlets and magnified instrumental installations. Motor-operated curtains are provided for darkening the main lecture room in the electrical engineering department, and a most complete provision of electric service outlets for the use of projector lamps is made.

Many machines in the various departments are driven by direct-connected motors, including hoists, cranes, lathes and tools for routine and instruction work. Electrical temperature control is provided for many laboratories. This is accomplished by a sensitive contact-making thermometer, a special relay of fine adjustment and an electrical heating element. The temperature control thus obtained is applied to various baths, ovens, insulated rooms, etc., and in some cases the temperature can be held within 0.002 deg. C. In the chemical laboratories a wide range of electrical service is available and many motor applications are in use, including fans for general and special ventilation, stirrers for mixtures, with electric furnace equipment, regulators and widely diversified outlets. A large variety of storage battery, motor-generator and outlet service is also provided for the department of physics.

Special rooms are equipped for low-temperature work, liquid air, vacuo, electric discharge and radio study, special electric heating applications, heat measurement equipment, optical study, metallurgical research and numerous other activities in which electrical service adds to the convenience, speed and reliability of the educational or experimental results.

Preventing Interruption of Production

Continuous Supply of Motive Power Imperative in These Times—What Can Be Done in Selecting and Inspecting Electrical Equipment to Assure Its Uninterrupted Maintenance

BY SYDNEY FISHER
Process Engineer, Bridgeport Brass Company

THE importance of an adequate uninterrupted supply of motive power is appreciated by all production engineers. In many cases, however, it is given comparatively little consideration in the press of routing, machine layout and other problems, because the latter are of relatively greater importance to the production engineer. The inevitable result is motor breakdown and consequent interrupted production when production problems are supposed to have been solved and the plant should be taking its full load. Many engineers play very safe and install more than enough motor-power equipment. This is particularly true in the case of munition plants where the supply of money is plentiful.

There are two objections to this overcautiousness, however. One is the fact that the available supply of motors is relatively low; hence the rating should approximate closely the actual requirements, as otherwise labor and equipment many have to wait for power. The other objection involves the operating difficulties that inevitably result from over-motoring, particularly where the equipment is of the alternating-current type and the reactive power is an important consideration. The writer has been called in on two cases where the reactive power demand has greatly exceeded the average power demand, hence causing a breakdown of transforming transmission equipment. The design of the motive-power equipment of the plant should be placed in the hands of a competent electrical engineer to whom all layouts of machinery requiring power should be submitted for the selection and location of the motor or motors and for any recommendations he may see fit to make.

The following suggestions on the selection, installation, operation and maintenance of motor equipment are based on experience at three munition plants. For group drive and individual drives requiring constant speed the three-phase, 60-cycle squirrel-cage induction motor is without question the most desirable type of motor for industrial work. It is of very simple design and very rugged, two factors which make for ease of construction, with resulting low cost and large supply and low maintenance respectively. This motor will take sudden load variations up to 200 per cent of its rated full-load torque with a comparatively small variation in speed and with small temperature rise. This type of motor is very satisfactory for drop-hammer, punch-press and upsetting-machine drives, the load on which is very variable.

Fig. 1 gives the load variation on a 25-hp., three-phase, 60-cycle squirrel-cage motor driving barrel-rolling equipment consisting of a hot roll, an 800-lb. (362.9-kg.) drop hammer and double hot saw 36 in. (91.4 cm.) in diameter. This motor has operated for more than a year during three eight-hour shifts per day without breakdown.

Four hundred and forty volt motors are very satisfactory, the cost of wiring to serve them being much lower than that for 200-volt motors. As to speed, the 1200-r.p.m. motors are cheaper, but they give considerable bearing trouble, particularly with belt drive. Therefore 900-r.p.m. motors are more satisfactory.

The question of group versus individual drive is a very important one. Production engineers who have had the bitter experience of trying to get maximum production with a poorly designed, badly maintained motor equipment are apt to decide in favor of the individual drive. Instead of judging any type of drive hastily, however, it would be better to consider the relative merits of a well-designed group drive and an individual motor drive for the same group of machines. To illustrate how this can be done consider Fig. 3. The load curve shown is that of a drive which has operated without breakdown during the last eighteen months and may be considered a good design. An individual motor drive for the same group of machines might be determined from the data given on the curve as follows:

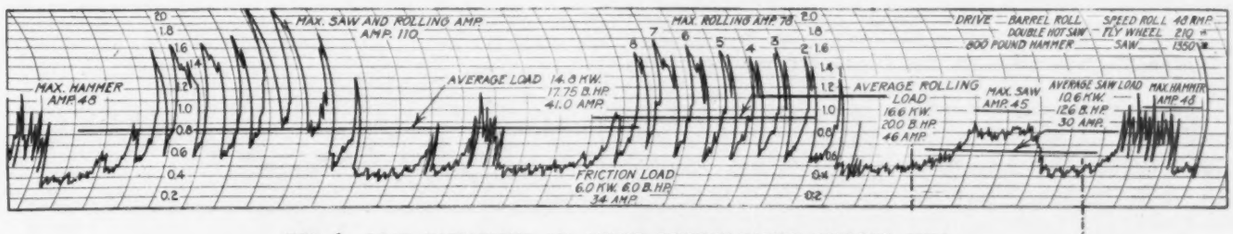

MAX. SAW AND ROLLING AMP. 110
MAX. ROLLING AMP. 78
DRIVE — BARREL ROLL
DOUBLE HOT SAW
800 POUND HAMMER
SPEED ROLL 48 R.M.P.
FLY WHEEL 210
SAW 1550
MAX. HAMMER AMP. 48
AVERAGE LOAD 14.8 K.W. 17.75 B.HP. 41.0 AMP.
AVERAGE ROLLING LOAD 16.6 K.W. 200 B.HP. 46 AMP.
MAX. SAW AMP. 45
AVERAGE SAW LOAD 10.6 K.W. 12.6 B.HP. 30 AMP.
MAX. HAMMER AMP. 48
FRICTION LOAD 6.0 K.W. 6.0 B.HP. 34 AMP.

FIG. 1—LOAD VARIATIONS ON MOTOR DRIVING BARREL-ROLLING MILL

The motor is rated at 25 hp. and 244 volts, and it drives a hot roll, an 800-lb. drop hammer and a double hot saw 36 in. in diameter.

The peak-load 26.1 brake-hp. labeled "Work arrives, machines take load," is doubtless due to all twenty machines taking their maximum load simultaneously, hence the combined friction and cutting load per machine would be $(26.1 - 5) \div 20 = 21.1/20 = 1.05$ brake-hp., 5 hp. being the line and countershaft friction load. To make the equipment flexible enough to cover possible changes of spindle speed, rate of feed and depth of cut, it would be advisable to provide 25 per cent re-

serve capacity, hence twenty 1.25-hp. motors would be the equivalent of the group drive. It should be noted here that the diversity factor which exists with the group drive, but is absent in the individual drive, would cover small changes of spindle speed, rate of feed and depth of cut on about half the machines in the group.

Comparing the cost of the motor equipment in both cases, exclusive of cost of wiring, which would be con-

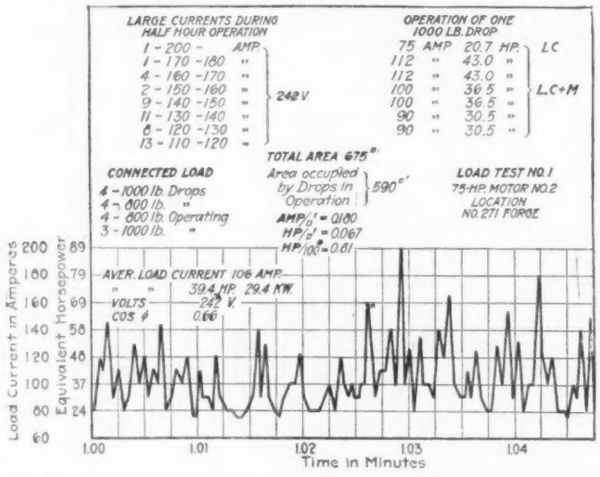

LARGE CURRENTS DURING HALF HOUR OPERATION
1 - 200 - AMP.
1 - 170 - 180 "
4 - 160 - 170 "
2 - 150 - 160 "
9 - 140 - 150 "
11 - 130 - 140 "
6 - 120 - 130 "
13 - 110 - 120 "
242 V
OPERATION OF ONE 1000 LB. DROP
75 AMP. 20.7 HP.
112 " 43.0 "
112 " 43.0 "
100 " 36.5 "
100 " 36.5 "
90 " 30.5 "
90 " 30.5 "
LC
LC+M
TOTAL AREA 675
CONNECTED LOAD
4 - 1000 lb. Drops
4 - 800 lb. "
4 - 600 lb. Operating
3 - 1000 lb. "
Area occupied by Drops in Operation
590
AMP/in² = 0.180
HP/in² = 0.067
HP/100 = 0.81
LOAD TEST NO. 1
75-HP. MOTOR NO. 2
LOCATION NO. 271 FORGE
AVER. LOAD CURRENT 106 AMP.
" 39.4 HP 29.4 KW.
VOLTS 242 V.
COS φ 0.66
Load Current in Amperes
Equivalent Horsepower
200 160 120 100 80 60
89 79 69 58 48 37 24
1.00 1.01 1.02 1.03 1.04
Time in Minutes

FIG. 2—LOAD FLUCTUATIONS ON A MOTOR DRIVING A GROUP OF DROP HAMMERS

siderably greater for the individual drive and take a greater length of time to install, one 20-hp. motor with compensator would cost $460, whereas twenty 1.25-hp. motors with starting switches at $102 would cost approximately $2,040. A small factory having forty such groups would require approximately forty 20-hp. motors for group drive and 800 1.25-hp. motors for individual drive. With the large order balances now carried by the large electrical companies, it is probable that a better delivery would be obtained on forty 20-hp. motors than on 800 1.25-hp. motors.

Regarding the relative cost and time of delivery of shafting, hangers, pulleys, belting and counter-shafting required for the group drives and the change gears required for the individual drives, both involve steel and labor, two items which are at a premium at the present time.

POWER FACTOR WITH GROUP AND INDIVIDUAL DRIVE

The average power demand of the group drive is greater than that of the individual drive, owing to a continuous friction load required by shafting, belting, etc. The friction load varies from 25 to 35 per cent. On well-designed drives, however, the power factor is relatively high and the reactive power demand correspondingly low. For the individual drive the average load per motor is lower, there being no shafting, belting, counter-shafting, etc., and no diversity factor. This low average load coupled with the inherently low power factor for small motors results in a low total power factor.

In the case of large plants with a central power station where process steam and steam for heating are in great demand the additional power demand for friction is very desirable, while the high power factor makes for high turbine efficiency. Where an outside power supply is depended upon, the expense of power for friction is of course undesirable; on the other hand, additional expense is usually incurred by a low-power-factor load.

The relative ratings of transformers, cables and generators required for each type of drive might be compared as follows:

$Kw._g$ — Group kw. (approximately 80 per cent power factor).

$Kva._g = kw._g \div 0.80 =$ group kva.

$Kw._i = 0.75$ kw.$_g$ (assuming 25 per cent friction load) = kw. for individual drive (approximately 60 per cent power factor).

$Kva._i = kw._i \div 0.60 = 0.75$ kw.$_g \div 0.60 = 1.25$ kw.$_g$

$$\frac{Kva._g}{Kva._i} = 1.25 \div 1.25 = 1.$$

Inasmuch as the required capacity of generators, cables and transformers determined by the kva. load is practically the same in both cases the initial investment of this equipment and time of delivery do not differ. The maintenance of motor equipment is unquestionably higher with individual drives. This, of course, is inevitable with such a large number of units each operated by an employee whose chief consideration so far as the motor is concerned is to close and open the switch as required. Of course, breakdown of the motor involves only the shutdown of the machine which it drives, whereas shutdown of a group motor entails the shutdown of every machine in the group. Serious shutdown of a group motor should be a rare occurrence, however, if (1) the drive is carefully designed, if (2) adequate inspection of motor equipment is maintained, and if (3) an efficient maintenance force is available.

The common method of ascertaining the size of motor required is to add the power requirements of the machines driven, as given in the manufacturer's catalog, and apply what is commonly called a load factor. This more or less hit-and-miss method usually results in the selection of motors either too large or too small. A glance at the load curve in Fig. 3 will suffice to show that the power required to overcome machine friction is only about 25 per cent of the total power demands, the greater portion of the power being required for machining. In other words, power demand is determined by the class of work done on the machine. It is a function of (1) the spindle speed and rate of feed, (2) the depth and width of cut, and (3) the diversity factor, which depends on the length of cut and the number of machines per operator.

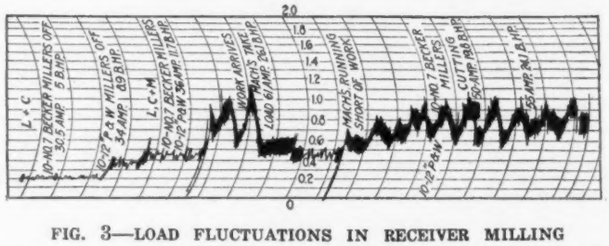


FIG. 3—LOAD FLUCTUATIONS IN RECEIVER MILLING

The motor is rated at 20 hp., 238 volts; the length of line shaft is 126 ft. Twenty-two belts are used, 50 per cent of which are crossed and 100 per cent are double. L.C. and M. per sq.ft. = 0.0102; L.C.M. and m. per sq.ft. = 0.0173; L. and C. per ft. of line = 0.04; L. and C./L.C. and M. = 0.43; L. and C./M. = 0.75; power machining ÷ power L.C. and M. = 0.70; maximum demand ÷ average demand = 1.22. L.C. is line and countershaft friction load, M. being machine friction.

Careful consideration of item 3 is of the utmost importance. For instance, even with the same conditions

of operation as regards spindle speed, rate of feed and depth of cut, a larger motor is required for a cut 12 in. (30.5 cm.) long in the direction of feed than would be required for a cut 2 in. (5.1 cm.) long, because a larger number of machines would require power simultaneously. Similarly a one-machine-per-operator condition would require more power than a two-machine-per-operator condition, since the number of machines cutting at the same time would be greater. The effect of the diversity factor is illustrated in the curve shown in Fig. 3. The peak load occurred immediately after the arrival of the work and was evidently the result of all machines operating simultaneously, being considerably higher than the peaks during normal operation.

Two ammeters (0-50 and 0-150), the characteristic curves of stock sizes of motors (10, 15, 20 hp., etc.) and a few typical machine groups to experiment on should provide sufficient data for the motor layout design of most of the common machine-tool groups. Characteristic curves of a 50-hp. motor are shown below, also a synopsis of the method of calculation by which they were obtained.

MOTOR CHARACTERISTIC CURVES

1. Efficiency and power factor at half, three-quarters, full and one and a quarter times full-load output for standard sizes of 220-volt, three-phase, 60-cycle, 900-r.p.m., constant-speed induction motors. These data were obtained from the motor-manufacturing company's price book.
2. No-load input and no-load current values, obtained by test on standard motors.

Method of Procedure:

1. Input-output curves were plotted from above data, 1 and 2. Input = output ÷ efficiency.
2. Efficiency curves were plotted from input-output curve, which supplied values of efficiency below half full load.
3. Load-current curves were obtained by substitution in following relation:

$$P = (1.732IE \cos\Theta E) \div 746.$$

$$I = (746 \times P) \div (1.732E \cos\Theta E) = [746 \div (1.732 \times 240)] \times [P \div (\cos\Theta \times E)] = 1.795 \times (P \div \cos\Theta \times E).$$

I = load current.
E = line volts (240 volts).
$\cos\Theta$ = power factor given by manufacturer.
E = efficiency given by manufacturer.
P = power output (hp.).

Four points were obtained by calculation, using data No. 1 and a fifth point from data No. 2.

4. Power factor curves were plotted using four points from data No. 1. An additional point was obtained by substituting no-load current and no-load power input in $\cos\Theta$ = watt input ÷ $1.732EI$.

The use of the ammeters and the characteristic curves are demonstrated by the data given under Fig. 2. These data were obtained from a test on a 75-hp. motor driving a group of drop hammers and were subsequently used to design six similar drives.

Good judgment is a very valuable factor, of course. Accurate data obtained from a few careful experiments and applied with good judgment will result in economy of time and capital and will assure continuous and satisfactory operation. It is desirable from an economy and operating standpoint to design for an average load which is not less than 90 per cent of the rated load of the motor. Advantage should be taken of the overload capacity of the motor in every case. In this connection a chain drive should be used for the main drive, since the pulleys supplied by motor manufacturers apparently (from the experience of the writer) are not designed to transmit the overload which the motor is capable of carrying without slip.

INSPECTION AND MAINTENANCE SERVICE

Assuming that the motors have been carefully laid out, they should run without shutdown if given a reasonable amount of care. By care is meant adequate inspection to locate the cause of trouble before it reaches the danger point and immediate attention by an efficient maintenance force to correct the cause. It is the policy of many plants to expect machine operators and floor foremen to report the cause of breakdowns, but such practice does not bring satisfactory results since machine operators and foremen are responsible for production and that is the chief subject in which they are interested. They have neither the inclination nor the time, if they are attending to their work properly, to keep track of service equipment. It is eminently the

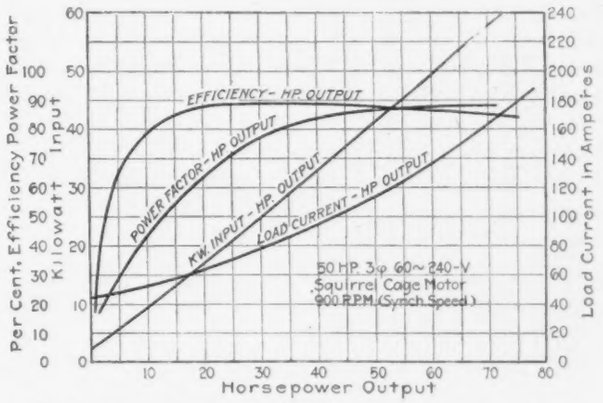

Per Cent. Efficiency Power Factor
Kilowatt Input
Load Current in Amperes
Horsepower Output
EFFICIENCY - HP. OUTPUT
POWER FACTOR - HP. OUTPUT
KW. INPUT - HP. OUTPUT
LOAD CURRENT - HP. OUTPUT
50 HP. 3φ 60~ 240-V
Squirrel Cage Motor
900 R.P.M. (Synch. Speed)

FIG. 4—CHARACTERISTICS OF 50-HP. MOTOR USED IN STUDY

function of the service department to see that its equipment is kept in proper shape to insure continuity of service, and this can only be done by an adequate inspection force. This does not necessarily mean an increase in the service force, as the work of an efficient inspection force will result in an elimination of trouble to such an extent that the maintenance force will have ample time for inspection work and may, therefore, ultimately replace the original inspection force.

Adequate inspection is maintained in one of the biggest munition plants in this country, and breakdowns, particularly of motor equipment, are very rare. This inspection work is carried on almost exclusively by maintenance men; hence, comparatively speaking, the cost of inspection in this case is almost negligible.

The inspection of motor equipment should include the observation of the following items:

Motor.

1. Oil supply.
2. Freedom of oil rings.
3. Application of gap gage to air gap.
4. Main-drive belt tension.
5. Slip-ring surface.
6. Speed test.
7. Motor temperature.
8. Observation of conditions in shop which would affect the operation of motor.

Control Apparatus.

1. Condition of make-and-break switches.
2. Condition of overload release on compensator.
3. Examination of compensator contacts, particularly on the running side.

4. Inspection of overload relays (timing, damping, etc.).
5. Oil supply in compensator.
6. Temperature of compensator—no-voltage-release coil.

A frequent cause of motor shutdown is defective starting and control apparatus. This is largely due to careless manipulation of the former and improper adjustment of the latter. It is essential, therefore, to provide comprehensive instructions covering the starting and stopping of motors, and to train one of the machine operators on each floor for this work. Most of the trouble is caused during noon hour when motors are "hobbed" in order to place the belts. "Hobbing" is prolific of more breakdowns than any other cause with the possible exception of seized bearings resulting from excessive belt tension or lack of oil. If a motor accelerates too rapidly to permit placing a belt safely, the compensator taps should be adjusted to cause a lower acceleration.

An efficient, enthusiastic maintenance force is one of the biggest assets that an industrial plant can have. The word enthusiastic is by no means misapplied as the conditions under which these men have to work and the rapidity with which they have to work are very trying. Properly directed, an enthusiastic force will correct a shutdown in jig time.

The training of an efficient maintenance force is largely a matter of personal contact of the chief electrician or electrical engineer with his men. An hour or two per week given to instruction of the men in the fundamental principles of electrical engineering and their practical application will accomplish wonderful results.

The electrical engineer should draw up a logical method of procedure to determine the cause of motor breakdown. This has been found to be a great time saver as compared with the usual hit-and-miss methods employed by the average electrician. Such a method of procedure might be framed as follows:

SUGGESTED PROCEDURE IN CASE OF BREAKDOWN

In case of motor shutdown the following method of procedure is to be followed unless the cause of shutdown is immediately apparent.

Test temperature of motor by hand.

1. If temperature of frame, including bearing, is uniform, examine fuses or relays; replace blown fuses and examine relay timing adjustment and damping device.

Start motor and stand by.

2. If temperature of bearing is abnormal, look in oil chamber. If full of oil, examine oil ring to see if it revolves freely. Reset relays or replace blown fuses. Jerk starting lever and observe motor shaft and chain or belt. If there is no motion, there is a seized motor bearing. Call for emergency motor.
3. If temperature of frame is uniform but abnormal, replace blown fuses or reset relays and start motor. Take speed of motor. If speed of motor is less than full-load speed, motor is overloaded. Inquire of floor foreman about changes in operation and look for seized shaft bearing. If either is the cause, notify chief electrician immediately.

Overheating of a three-phase motor is frequently caused by running single-phase, one phase being broken by a bad compensator contact on the running side; therefore examine compensator contacts on the running side and rectify if necessary.

The reason for the various steps should be carefully explained and every effort made to get the men to memorize the instructions.

The cost of delay in the event of breakdown can be substantially reduced by installing two motors per section and providing an auxiliary jack belt so that either section can be driven from the adjoining section. By doing this and providing extra cooling for the motor operated the writer has managed to keep a large portion of the machinery in similarly divided sections running until a new motor could be installed. A 20-hp. motor in one case carried 32 hp. for four hours, suitable additional ventilation having been provided as mentioned above.

In conclusion, decide on the best make of motor and install it throughout. This will substantially reduce the number of spares and spare parts to be kept on hand.

OUTDOOR DISTRIBUTION SUBSTATIONS IN WAR TIMES

Three-Phase Transformers with Automatic Pole-Top Oil Switches in Primary—An Innovation Found Suitable Under Certain Conditions

BY R. E. CUNNINGHAM
Superintendent of Distribution, Southern California Edison Company

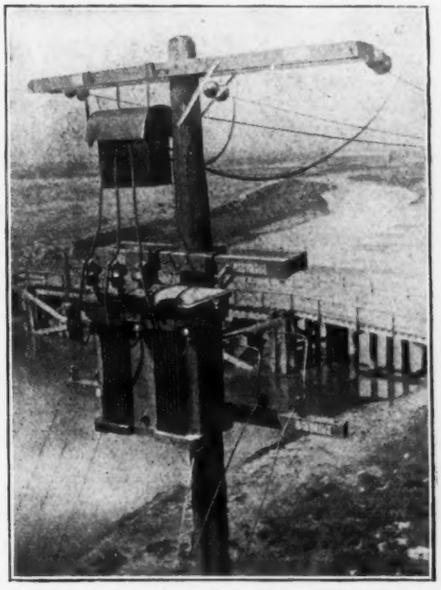
WAR-TIME conditions make it necessary for the power companies to use special care in order to obtain the greatest return for each dollar expended. The outdoor substation has proved to be the simplest and most economical means of serving large consumers, and the favorable climate of southern California makes its operation entirely reliable. Some of the 10,000-volt installations of the Southern California Edison Company are shown by the accompanying photographs. The features of interest in connection with these installations are their simplicity and general appearance.

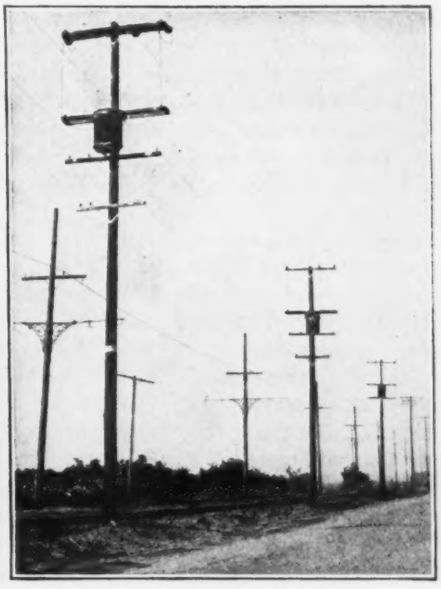
Manufacturers have produced outdoor-type transformers which are entirely satisfactory for all moderate voltages. It has therefore only been left to the operating engineer to select switching and protective apparatus and properly arrange the equipment. Most distribution outdoor substations have been equipped with fused-type switches. Our experience with such switches has shown that they are not entirely reliable on account of the inherent weaknesses of high-potential fuses. Particularly on three-phase service we have trouble with one fuse failing, allowing the motors to operate single-phase and in many cases resulting in burn-out of the consumer's equipment.

In order to overcome this condition, a local manufacturer has made for us an automatic outdoor pole-top switch for service on 10,000 volts. We have more than 200 of these switches now in use, all of them having given satisfactory service. This is a single-tank switch, equipped with three series overload trip coils, so that an overload on any wire of a three-phase circuit will entirely disconnect the service. The switch is controlled by pull cables from the ground, and the consumer can immediately restore the service in case the switch has been kicked out by momentary overload. This saves the consumer a long interruption which would otherwise exist, with the use of fuse switches, since the company

would have to send out a troubleman to replace the burned-out fuses.

When extra heavy loads are to be started or fluctuating conditions are encountered, a simple time-limit device can be attached to the plunger of each overload relay, which prevents the switch kicking out except in cases of actual trouble or continued overloads. This switch also allows the consumer to disconnect his transformers when they are not in actual use, saving to the power company the energy lost in exciting the transformers and removing all hazard of energized wires on the consumer's property. With a switch of this type on the primary side of the transformers installed within 30 ft. (9 m.) of the entrance to the property, the local authorities have ruled that the main entrance switch on the secondaries is not required.





FIGS. 1, 2 AND 3—AUTOMATIC OUTDOOR-TYPE SWITCH CONNECTED TO 10,000-VOLT LINE; TRANSFORMERS OF SAME BANK INSTALLED ON SEPARATE POLES TO IMPROVE APPEARANCE, AND TRANSFORMERS ON ELEVATED PLATFORMS

OUTDOOR SWITCHES AND TRANSFORMERS

One of the automatic outdoor pole-top switches connected to a 10,000-volt line and protecting a 50-kw., three-phase transformer is shown in Fig. 1. Inexpensive-type disconnecting lugs are placed on the first pole away from the switch so that it is possible to entirely disconnect the line from the oil switch and inspect or readjust it when necessary. The switch-operating cables are attached to a pulley wheel mounted on the main operating shaft passing through the top of the switch tank. The pulley wheel is placed nearest the pole, and on the opposite end of the shaft, in plain view from the ground, is an indicating dial which definitely shows when the switch is open or closed. It can be easily seen that with this arrangement there is a minimum amount of labor and material in installing and connecting the apparatus, as the transformer has been designed with a very convenient arrangement of leads. Three-phase transformers up to 100 kw. are mounted in this manner.

An installation of three 50-kw., 10,000-2300-volt transformers is shown in Fig. 2. In this case it was necessary to provide 2300-volt three-phase service for a suburban town, and as our lines are installed along an important boulevard, the usual type of overhead racks on which to mount the transformers was objectionable. Hence each transformer is mounted on a line pole separated from the others by the usual length of spans, a protective pole-top switch being installed on the fourth pole. The installation is not noticeable to persons driving along the boulevard and at the same time entirely fulfills the requirements.

Three 100-kw. transformers furnishing 2300-volt service to serve kelp plants producing potash are shown in Fig. 3. In this case the high-tension lines could not be extended closer than about a mile from the plants on account of right-of-way difficulties and the impossibility of installing a high-tension line along a state highway, both sides of which were already occupied by important telephone lines. The steel frame was made up of extra parts of steel towers, which were redrilled for the purpose in our own shop, thus utilizing idle material. A protective switch has been placed on the high-tension side of the transformers on the next adjoining pole. The 2300-volt side of the transformers is connected directly to the line.

A century and a quarter ago it was deliberately ordained by those who were then responsible for the safety and defense of the nation that the duty of military service should rest upon all able-bodied men between the ages of eighteen and forty-five. We now accept and fulfill the obligation which they established, an obligation expressed in our national statutes from that time until now. We solemnly purpose a decisive victory of arms, and deliberately to devote the larger part of the military man power of the nation to the accomplishment of that purpose.—*President Wilson.*

Reconstruction of a Two-Phase Station—I

How Some Problems Made Necessary by Rapid Load Developments Were Handled by an Iowa Company—Description of the Furnace Equipment and the Efficiency Instruments Installed in the Plant

FROM a small non-condensing engine plant supplying electricity and a small amount of steam for district heating, the Iowa Railway & Light Company of Cedar Rapids has developed in a few short years into a modern electric transmission system serving a territory 200 miles (320 km.) long and 75 miles (120 km.) wide and, besides, is selling millions of pounds of superheated steam. Development had to keep step with this rapid growth in business, and as a result some unusual engineering problems were involved. How some of these have been worked out will be told in this article.

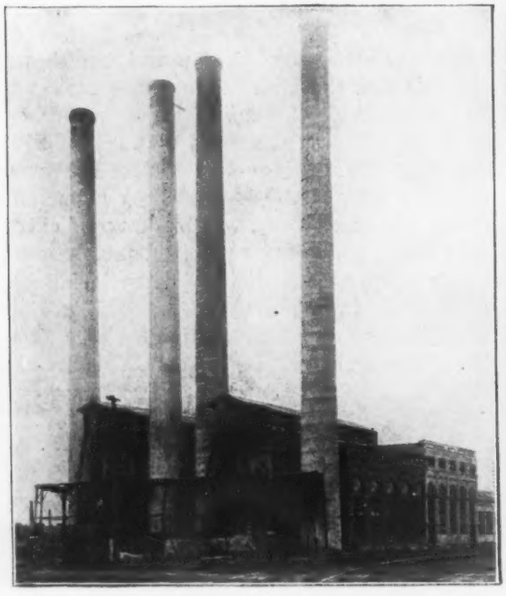
In analyzing this development several unusual factors which no doubt had influence on engineering decisions need to be kept in mind. First, the daily sale of 600,000 lb. (272,000 kg.) to 800,000 lb (363,000 kg.) of live steam at 200 lb. (14.1 kg. per sq.cm.) pressure and 100 deg. superheat to the Quaker Oats Company from a plant selling about 140,000 kw.-hr. of electrical energy per day demanded a comparatively large boiler plant; second, the early development of the two-phase system of distribution in Cedar Rapids built up a heavy investment in two-phase equipment not only in the power house but among the company's customers, and, third, the rapid growth of the company's electrical system not only in Cedar Rapids but also in distant outlying territory could best be reached by three-phase high-voltage transmission.

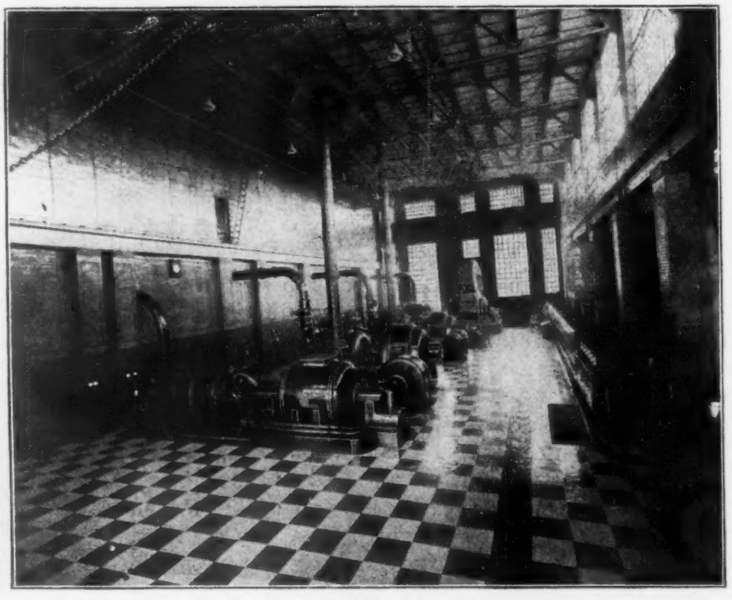
One of the first steps in the development consisted of taking over of the street-railway load. A 1500-kw. turbo-generator was added to the plant, and a little later two 3500-kw. turbine units of the bleeder type were installed to care for the increasing load and the heating system as well. Taking the heating steam at an average of 15 lb. (100 gm. per sq.cm.) from the turbines eliminated the trouble that had been experienced previously from oil and impurities throughout the system and reduced to a great extent the labor required for maintenance. From the operating standpoint there was another advantage. In case of boiler trouble or an insufficient supply of steam reducing the pressure, the turbines could be operated condensing at their full economy and the bleeder connections closed until the steam pressure was back to normal.

These large demands on the plant and the growth of the system throughout the state called for more capacity and made it necessary to remodel the plant. An addition was made to the boiler room, more than doubling its capacity, and the turbine room was entirely rebuilt. The steel work was put up inside the old walls, holes cut in the roof allowing it to pass through. The old roof was supported by this steelwork while the new walls and roof were being built and upon their completion was torn out.

Throughout the reconstruction service was maintained by the three turbo-generators. The engine units were removed, and in 1917 a new turbo-generator rated at 7500 kw. was installed, making the present capacity of the plant 16,000 kw. All of the units are two-phase, 60-cycle machines having a speed of 1800 r.p.m. and generating at 2300 volts. Before the remodeling of the plant a change from two-phase to three-phase generators was seriously considered, but the investment in motors that would have been required made the financial aspect rather unfavorable.

The condensers are of the surface type. The one





FIGS. 1 AND 2—EXTERIOR OF RECONSTRUCTED STATION, AND TURBINE ROOM OF IOWA RAILWAY & LIGHT COMPANY

serving the 1500-kw. turbine has 3⅓ sq.ft. (about 300 sq.cm.) of surface per kilowatt of rating. It was installed years ago, and a liberal ratio was employed because of the fact that the air pumps were less efficient and the temperature of injection water high. An 8-in. by 16-in. by 20-in. (20-cm. by 40-cm. by 50-cm.) dry-vacuum pump is the only steam-driven auxiliary serv-

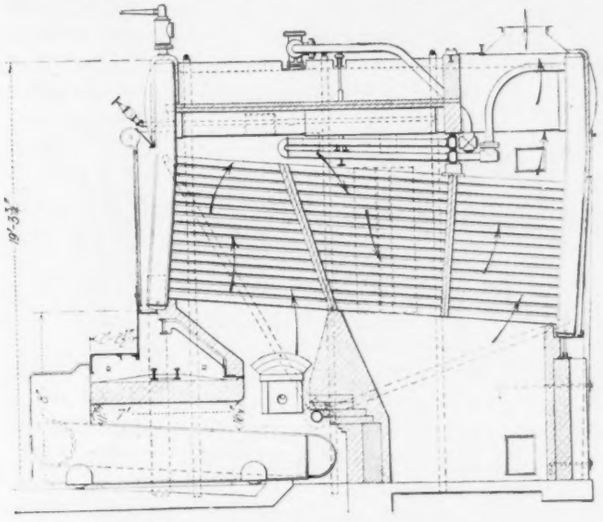


FIG. 3—OLD CHAIN-GRATE SETTING WITH CRAMPED COMBUSTION SPACE

ing the unit. Both the circulating pump, having a capacity of 5000 gal. (about 19,000 l.) per minute, and the condensate pump are motor-driven.

The auxiliaries for the two bleeder turbines are duplicates, the condensers having about 3 sq.ft. (2800 sq.cm.) of surface per kilowatt. The pumps are partly steam-driven and partly motor-driven. The condenser serving the new unit has 1.73 sq.ft. (1600 sq.cm.) of surface per kilowatt, a ratio conforming with late practice. The circulating pump, having a capacity of 15,000 gal. (over 55,000 l.) per minute, is driven by a 100-hp. motor, while the combination air and condensate pump is turbine-driven. As a reserve there is also a "Radojet" air pump and a motor-driven auxiliary hot-well pump.

All of the circulating pumps are connected to a common header, so that any combination of the four pumps may be used to meet the requirements of the units in operation. At times the pumps belonging to the bleeder turbines will fulfill the demand. At other times the pump for the large unit, and perhaps the small pump, may be used, so that the arrangement is flexible and results in saving considerable power.

Natural cooling ponds for the condenser water are an advantage possessed by the plant. Through a concrete tunnel the water is drawn from the nearest pond, about 100 ft. (30 m.) distant, and is discharged to a second pond connected with the first, the water traveling nearly a mile before it is returned to the intake.

It may be seen that there is a fair division between electric and steam-driven auxiliaries, the latter being required to maintain the heat balance. In this connection two of the three exciter sets are steam-driven—one rated at 100 kw. by a high-speed engine, and a 150-kw. exciter by a turbine through reduction gearing. The third exciter is rated at 75 kw. and is motor-driven. All pumps are direct-acting or turbine-driven, and the forced-draft fans are engine-driven, as are the stokers which they serve. The chain-grate stokers installed in the older portion of the boiler room are driven by two 5-hp. motors, each serving four boilers, and in addition two auxiliary engines are provided as emergency-driven units.

From these various sources there is considerable exhaust steam available to heat the feed water, and during the heating season it is badly needed. To illustrate, 70,000,000 lb. (over 30,000,000 kg.) of steam was delivered to the heating system last January, and as none of the condensation was returned to the plant, the same amount of make-up had to be heated from an average temperature of 40 to 210 deg., without the assistance of an economizer. The total steam generated was 150,000,000 lb. (68,000,000 kg.), so that the percentage of making up was nearly 50 per cent. From the Quaker Oats plant the returns mixed with make-up water from the river are brought back to the boiler room at a temperature of about 100 deg.

The continued use of so much raw water, with its consequent deposits of scale and fouling of boiler tubes, is another disadvantage under which the plant must operate. In an ordinary plant a water softener would relieve the trouble, but in the present case, where both steam and electricity are sold in varying quantities, it was found that a water softener having normal treating capacity and feeding separately into the heater aggravated instead of relieving the trouble.

The amount of steam sold varied so much that when the water was treated to a certain degree of hardness for one proportion of condensation, this proportion would be so changed within an hour that the water

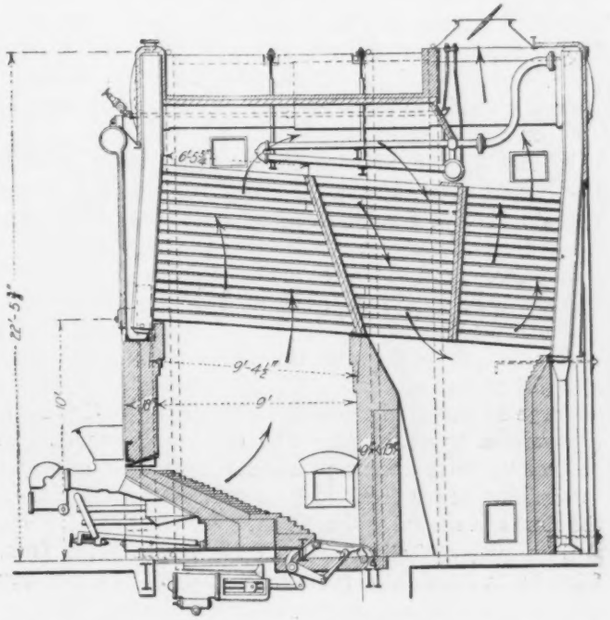
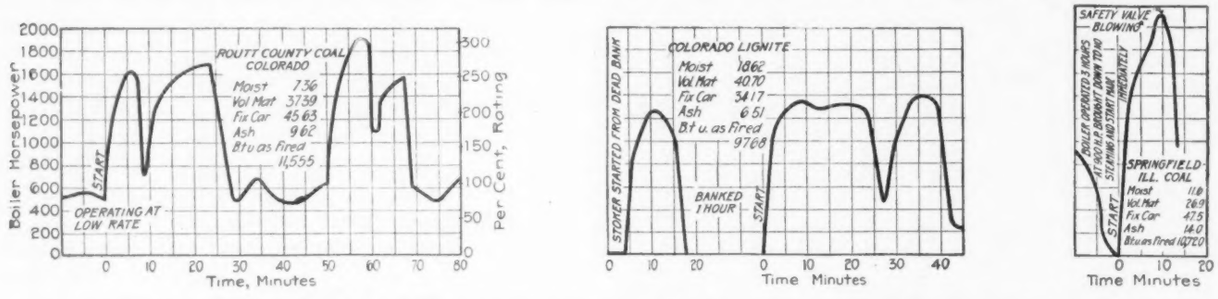


FIG. 4—SETTING ADOPTED WITH UNDERFEED STOKERS TO BURN HIGHLY VOLATILE FUEL

would be too soft and priming and foaming would occur, carrying the impurities from the boiler over to the turbines. Settling basins of large capacity in which the condensation and treated water could be thoroughly mixed before entering the heater are being considered, as it is thought such a plan would relieve the situation.

In the older section of the plant there were eight water-tube boilers arranged four on each side of a central firing aisle. Two of the boilers are rated at 400 hp. and the other six at 500 hp. They are served by chain-grate stokers having areas of 81 sq.ft. and 100 sq.ft. (7.5 sq.m. and 9.3 sq.m.) respectively. The two smaller boilers have Sewell baffling and the larger boilers are vertically baffled for three passes, the type of setting being shown in Fig. 3. To the bottom of the front header the head room is 8 ft. (2.5 m.), but a flat ignition arch extending well into the furnace reduces considerably the volume of the combustion chamber. At the stoker gate the head room is 11 in. (28 cm.) and at the rear of the arch 16 in. (40.8 cm.). Between the arch and a corbeled bridge wall there is a comparatively narrow throat to mix the gases, and beyond a large volume, expanding toward the tubes. With Kentucky and good grades of Illinois coal fair results were obtained from these settings, but with Iowa and certain Illinois coals, low in heat value and high in volatility, it proved difficult to maintain the boiler performance at 150 per cent of rating.



FIGS. 5, 6 AND 7—RESULTS OF TESTS WITH ROUTT COUNTY (COL.) LIGNITE AND SPRINGFIELD (ILL.) COAL

Fig. 5 shows results from Routt County (Col.) coal of the analysis given. With the stoker operating at nearly boiler rating, a sudden demand for steam occurs. The rating is increased as rapidly as possible, and thereafter high rates of steaming are required at intervals. In the test with Colorado lignite shown in Fig. 6 the stoker was started from a "dead bank." A high output is required for a short interval and the load goes off completely. The stoker is banked for an hour and is then called upon to meet a sudden and long-continued demand. Fig. 7 shows result from Springfield (Ill.) coal. With the stoker operating at 150 per cent of rating for three hours, the load was dropped to zero, then the maximum output was developed in the shortest possible time and the load was again dropped.

In making the addition to the boiler room, stokers that would respond to quick changes in load and would operate at considerable overload with Iowa coal were desired, and the choice was allotted to underfeed stokers with large power-operated dump plates. Seven-retort stokers were therefore used with water-tube boilers, which are rated at 627 hp. As shown in Fig. 4, the stoker is set flush with the boiler front, and with straight walls front and rear the combustion space is as large as the head room of 10 ft. (3 m.) will permit, the volume approximating 880 cu.ft. (25 cu.m.). In accordance with recent practice the first baffle slopes toward the boiler front to give contracting volumes in the first and second passes as the gases cool.

Operating at boiler rating, each stoker burns from 2500 lb. to 3000 lb. (1100 kg. to 1400 kg.) of coal per hour, depending somewhat upon the fuel used. On some occasions as high as 7400 lb. (3350 kg.) of coal per hour has been burned, or over 1000 lb (450 kg.) per retort. The furnace volume, on the basis of 3000 lb. and 7400 lb., reduces to 0.2933 cu.ft. and 0.119 cu.ft. (8300 cu.cm. and 3400 cu.cm.), per pound of coal burned per hour. An equivalent grate area of 94.5 sq.ft. (8.75 sq.m.) is credited to the stoker. The steam-making surface is about 66.4 times as large. Referring to the figures on fuel consumption previously given, 31.7 lb. and 78.3 lb. (340 kg. and 840 kg. per sq.m.) of coal respectively were burned per hour per square foot of grate.

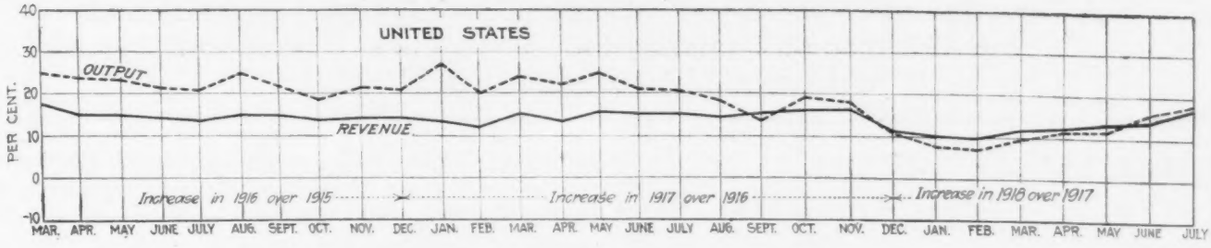
Some indication of the flexibility of operation is given by Figs. 5 to 7, which show results of tests made at the plant by the manufacturer of the stoker. Of numerous eight-hour tests conducted about the same time, one was made with Iowa slack coal from the Lakonta district. [The proximate analysis gave: Moisture, 9.7 per cent; volatile, 26.2 per cent; fixed carbon, 36.8 per cent; ash, 27.3 per cent; B.t.u. per pound of coal as fired, 9130 (105 cal. per kg.)]. Operating at an average rating of 168 per cent, 4875 lb. (2210 kg.) per hour of coal as fired was burned at a combined efficiency of 79.3 per cent. With Springfield (Ill.) slack of 9840 B.t.u. (110 cal. per kg.) as fired and 12 per cent moisture, 26 per cent volatile matter, 45.6 per cent fixed carbon and 16.4 per cent ash, 7400 lb. (3350 kg.) was burned per hour to maintain a load averaging 252.5 per cent of rating at a combined efficiency of 72.5 per cent.

From the foregoing it is quite evident that the stokers will care for quick changes in load and will carry heavy overloads at high efficiency when burning inferior coal. As to clinkers the boiler-room force reports no more trouble in proportion to the coal burned than with the chain-grate stokers.

Features of the boiler-room arrangement, methods of permitting flexible operation, use made of efficiency instruments and features of the electrical part of the station will be described in a later issue.

It is to be hoped that the paternalistic control of enterprise and industry, which is a necessary measure in war time, will not be permitted in our country to grow into a permanent feature of our governmental system, and that as soon as possible the fetters now placed upon private initiative and personal incentive will be removed and the genius of American individual enterprise set free again, with due regard, be it understood, for the welfare and opportunities of the masses of the people and for the duty of the state to protect those least able to protect themselves, and to prevent exploitation or oppression, undue privilege and unfair practices.—*Otto H. Kahn.*

Central Station July Operations


UNITED STATES
OUTPUT
REVENUE
PER CENT.
40
30
20
10
0
-10
Increase in 1916 over 1915
Increase in 1917 over 1916
Increase in 1918 over 1917
MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC. JAN. FEB. MAR. APR. MAY JUNE JULY

THE FIGURES OF GROWTH IN JULY ARE IMPRESSIVE

IT IS an old story to say that totals of central-station production of electrical energy continue to mount upward, but the figures of growth are so impressive that it would be illogical to fail to emphasize them. The July returns are particularly eloquent of the great volume of kilowatt-hour output which the properties are distributing to meet the needs of the nation's industries. Reports to the ELECTRICAL WORLD from 48 per cent of the industry show an increase in output, as compared with July, 1917, of 18.2 per cent and in revenue of 17.1 per cent. New England shows the striking gain of 30.2 per cent in kilowatt-hour output.

A fact of much significance in connection with the higher totals of current production is, as has been pointed out repeatedly, that the results of this year are added to a similar fine showing in the previous year. Thus, the increase of 18.2 per cent in July, 1918, over July, 1917, follows a gain in July, 1917, over July, 1916, of 20.8 per cent. That is to say, the returns indicate that July, 1918, was more than 42 per cent over the record of July, 1916. This conclusion, of course, is based on returns from varying proportions of the industry, but there is no reason to believe that the full figures, if they were obtainable, would cause substantial variation. The partial returns are an excellent barometer. Also it is important to consider that the scale of increase for the calendar year is still ascending rapidly as is shown by the improvement of each month over its predecessor since January, when the gain was but 6.3 per cent.

TABLE I—CENTRAL-STATION RETURNS FOR TWELVE MONTHS

	Percentage of Industry Represented	Revenue from the Sale of Energy			Kw.-Hr. Output		
		1917	1916	Per Cent Increase	1917	1916	Per Cent Increase
Aug.	63	$22,718,000	$19,972,000	13.8	1,451,928,000	1,223,373,000	18.7
Sept.	63	23,861,000	20,896,000	14.3	1,376,370,000	1,219,117,000	13.8
Oct.	62	25,748,000	22,334,000	15.4	1,522,149,000	1,279,140,000	19.5
Nov.	62	26,665,000	23,183,000	17.0	1,485,370,000	1,292,113,000	15.7
Dec.	58	28,144,000	25,026,000	12.4	1,517,001,000	1,362,299,000	11.0
		1918	1917		1918	1917	
Jan.	62	27,035,000	24,977,000	8.2	1,508,353,000	1,422,121,000	6.3
Feb.	60	24,690,000	22,307,000	10.6	1,254,217,000	1,168,288,000	7.1
Mar.	60	25,396,000	22,702,000	12.3	1,418,222,000	1,294,561,000	9.4
Apr.	60	25,864,000	22,966,000	12.6	1,450,221,000	1,297,843,000	11.5
May	62	25,365,000	22,426,000	13.1	1,537,527,000	1,372,935,000	11.9
June	56	23,470,000	20,577,000	14.0	1,407,585,000	1,212,870,000	16.0
July	48	18,076,000	15,437,000	17.1	1,134,170,000	959,273,000	18.2

Based on the returns from 48 per cent of the industry the ELECTRICAL WORLD estimate for July for the entire industry is: Revenue, $37,658,000; output, 2,362,800,000 kw.-hr.

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A TWELVE-MONTH PERIOD

	Month	Percentage of Industry Represented	New England States		Per Cent Increase	Percentage of Industry Represented	Atlantic States		Per Cent Increase	Percentage of Industry Represented	Central States		Per Cent Increase	Percentage of Industry Represented	Pacific and Mountain States		Per Cent Increase
			1917	1916			1917	1916			1917	1916			1917	1916	
REVENUE	August	64	$2,352,000	$2,025,000	16.2	65	$9,021,000	$7,881,000	14.5	53	$6,910,000	$5,718,000	20.9	87	$4,819,000	$4,270,000	21.9
	Sept.	64	2,811,000	2,362,000	19.0	64	9,139,000	7,963,000	14.7	53	7,232,000	6,177,000	17.1	87	4,636,000	4,355,000	6.4
	Oct.	64	3,057,000	2,530,000	20.7	66	10,683,000	9,173,000	16.5	52	7,422,000	6,304,000	17.8	85	4,586,000	4,327,000	6.1
	Nov.	64	3,391,000	2,834,000	19.7	65	10,159,000	8,873,000	14.5	52	8,454,000	7,063,000	19.7	84	4,661,000	4,410,000	5.9
	Dec.	64	3,483,000	2,999,000	16.1	58	10,834,000	9,949,000	8.8	48	8,935,000	7,464,000	19.7	82	4,892,000	4,614,000	0.6
			1918	1917			1918	1917			1918	1917			1918	1917	
	Jan.	63	3,393,000	2,990,000	13.8	64	9,677,000	9,517,000	1.6	53	8,862,000	7,639,000	16.8	86	5,113,000	4,831,000	5.8
	Feb.	62	2,995,000	2,272,000	8.0	57	9,473,000	8,658,000	8.6	53	7,779,000	6,746,000	15.3	84	4,443,000	4,131,000	9.5
	March	62	2,985,000	2,724,000	9.2	59	9,904,000	8,922,000	11.0	53	7,947,000	6,735,000	18.0	84	4,560,000	4,321,000	5.5
	April	62	2,890,000	2,578,000	12.1	59	10,054,000	8,946,000	12.4	53	8,431,000	7,103,000	18.7	84	4,489,000	4,339,000	3.5
	May	62	2,810,000	2,530,000	11.5	64	9,929,000	8,613,000	15.3	53	8,217,000	6,955,000	18.1	83	4,805,000	4,327,000	12.0
	June	58	2,664,000	2,340,000	13.8	53	7,992,000	7,141,000	11.9	48	7,800,000	6,571,000	19.1	84	4,966,000	4,425,000	12.2
	July	56	2,729,000	2,261,000	20.7	49	7,093,000	6,244,000	13.6	34	4,538,000	3,739,000	21.4	74	3,716,000	3,193,000	16.3
			1917	1916			1917	1916			1917	1916			1917	1916	
KW.-HR. OUTPUT	August	64	105,848,000	85,113,000	24.5	65	514,254,000	420,806,000	22.3	53	415,966,000	333,549,000	24.7	87	413,462,000	381,353,000	8.3
	Sept.	64	114,339,000	92,319,000	24.0	64	482,112,000	405,070,000	19.0	53	399,480,000	345,953,000	15.5	87	379,221,000	374,685,000	1.4
	Oct.	64	121,666,000	94,853,000	28.5	66	589,242,000	472,619,000	24.5	52	417,018,000	351,713,000	17.0	85	394,223,000	359,955,000	9.6
	Nov.	64	130,311,000	108,561,000	20.0	65	532,301,000	445,537,000	19.6	52	443,374,000	384,480,000	15.2	84	379,384,000	357,535,000	6.1
	Dec.	64	135,703,000	111,342,000	21.8	58	548,316,600	486,368,600	12.7	48	437,264,000	367,534,000	12.8	82	395,518,000	377,058,000	4.8
			1918	1917			1918	1917			1918	1917			1918	1917	
	Jan.	63	125,212,000	111,339,000	12.4	64	477,200,000	466,158,000	2.3	53	486,291,000	453,009,000	7.3	86	419,651,000	391,624,000	7.3
	Feb.	62	110,454,000	102,562,000	7.7	57	438,721,000	403,122,000	8.3	53	358,276,000	342,257,000	4.5	84	346,766,000	320,025,000	8.4
	March	62	121,518,000	111,576,000	8.9	59	501,320,000	452,250,000	10.8	53	398,166,000	356,860,000	11.5	84	397,218,000	373,875,000	6.2
	April	62	117,416,000	101,888,000	15.2	59	497,460,000	431,786,000	15.2	53	437,054,000	392,304,000	11.4	84	399,126,000	372,465,000	7.1
	May	62	121,751,000	105,601,000	15.3	64	512,202,000	455,977,000	12.3	53	441,202,000	401,560,000	9.0	83	462,372,000	406,797,000	13.6
	June	58	115,665,000	94,407,000	22.5	52	425,394,000	372,893,000	14.1	48	412,946,000	357,409,000	15.5	84	453,580,000	387,884,000	10.1
	July	56	123,569,000	94,913,000	30.2	49	409,729,000	348,227,000	17.6	34	233,181,000	198,133,000	17.6	74	367,691,000	318,000,000	15.6

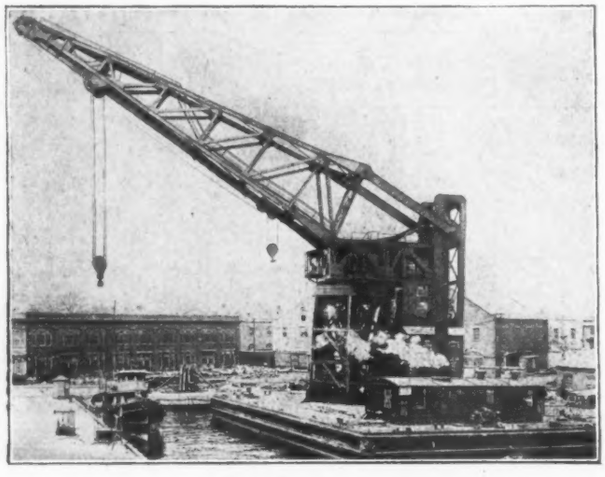
STATION & OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

LARGE ELECTRIC CRANE USED BY AMERICAN NAVY

Mounted on a Huge Pontoon with Self-Contained Steam Power Plant—Made Safe by Means of Regenerative Braking

Operating on the principle of an ordinary derrick, the revolving giant crane shown herewith, which is used by the United States Navy, can easily lift a complete tugboat from the water. The whole structure is mounted on a flatboat or a floating pontoon which is so designed that it cannot turn over. The boat contains a



HUGE NAVY CRANE CONTROLLED BY ELECTRICITY

complete boiler plant and an engine-driven generator which supplies the electric energy for operating the various motions of the crane. These motions are controlled from a small house mounted high above the deck.

The speed of the lifting can always be controlled by means of the electrical mechanism of the crane. When heavy loads are lowered the motors are used as generators, and thus the speed is controlled with great accuracy. In the case of an accidental interruption of electric energy, all of the crane's motions are automatically locked by means of brakes, thus making it impossible to drop the load. Safety and accuracy are essential, because the crane is used to handle large guns and turrets on battleships, and if through carelessness or inaccuracy these should be damaged it would entail a considerable loss.

The pontoon is 140 ft. long by 85 ft. wide by 15 ft. deep (42.6 m. by 25.9 m. by 4.6 m.). The generator is rated at 150 kw., and the crane has a main hoist consisting of two hooks of 75 tons and an auxiliary hoist of 25 tons capacity movable in a vertical plane. The crane rotates in a complete circle, the rotating being controlled by two 60-hp. Westinghouse motors. The boom luffs up and down from a practically vertical position to an angle of about 30 deg. from the horizontal in its lowest position. This luffing is accomplished by two 10-in. (25.5-cm.) screws operated by two 60-hp. Westinghouse motors, and the main hoists can operate separately or simultaneously as desired. When lifting the maximum load the crane is operated by two 60-hp. Westinghouse type MC motors. The auxiliary hoist has separate motors for hoisting and trolleying, each of which is 60 hp. The counterbalance at the rear end of the crane amounts to 200 tons, and the total weight of the pontoon crane (displacement) is 2500 tons. Four electrically driven capstans are placed at the four corners of the pontoon. The speed of the main hoist is about 6 ft. (1.8 m.) per minute, and that of the auxiliary hoist 30 ft. (9 m.) per minute.

Buy Bonds and Back the Guns

WATT-HOUR METERS TESTED AT DISTRICT REPAIR SHOPS

Central Station Covering Large Territory Places Repair Tables at Convenient Locations to Reduce Haulage and Breakage

BY C. W. WARD

In order to reduce as much as possible the transportation of meters from consumer's property to the main testing laboratory, with the consequent handling and breakage, the Duquesne Light Company of Pittsburgh, Pa., has installed test and repair tables at the center of certain districts of the city. The original idea in having meter test and repair tables at the various district headquarters and substations was that the meter tester working in any locality would repair and test such meters as were removed from service for any cause whatever in his district. In this way the meter tester could be provided with work inside the station on rainy days and at times when he might otherwise be idle. However, owing to the large reduction in the force of meter testers due to existing conditions, the original idea could not be carried out, and the test benches were utilized in three places in substations by teaching the substation operator to repair and test the meters.

At other headquarters, where the meters are accumulating and where the utilization of the idle hours of the substation attendant is not possible, it is intended to have women testers constantly go from one headquarters to another for the purpose of testing these meters. It has been found that only meters in reasonably good condition can be handled in this manner. Meters requiring new coils or new parts other than jewels or pivots are returned to the main laboratory in the usual manner.

The test tables are equipped with suitable switching devices, with a ground test for 1000 volts and a drawer for repair parts, and some are equipped with permanent loading devices. In other cases the portable load boxes of the tester are used. Permanent rotating standards mounted on each table especially for the purpose consist of a regular service-type meter wound with both 1-amp. and 20-amp. series coils and having graduated disks and revolution counter.

The average cost for repair and test of meters handled in this manner is somewhat less than the cost at the laboratory, but this is due principally to the fact that the laboratory receives only those meters in the worst condition.

The Bloody Kaiser Fears Liberty

ELECTROLYTIC PLANT FAVORS USE OF SMOOTH COMMUTATORS

Long Experience with Both Undercut and Smooth Type Shows that Best Service Can Be Obtained by Use of Latter

BY C. F. HUTCHINGS
General Manager North American Chemical Company

Because continuity of service in an electrolytic plant is one of the most important factors entering into the plant's success, the matter of having an adequate supply of electrical energy at all times is absolutely vital. This factor led a chemical company in the Middle West to study closely the varying conditions with both smooth and undercut commutators on its generators. It was found that although 100 per cent service continuity and load factor could be obtained when smooth commutators were used on generators and motors, no like results could be obtained with the undercut commutators.

This record was made possible by the use of an ordinary grade of domestic-made brush and by taking daily care of the commutator. Each morning two men sandpaper the commutators with the paper attached to a concave-shaped wood block. One man applies the block, the other holds a bunch of dry waste against the commutator directly behind the block to catch the copper dust. Each machine is thus treated for about thirty minutes. Then, without detaching any shunt wires, each brush is slipped from its holder and cleaned with sandpaper just enough to remove the particles of copper that may lodge on the wearing surface. The brush is then replaced and the machine will operate satisfactorily for another twenty-four hours. One would ordinarily suppose that sanding would rapidly reduce the commutator diameter, but this has not been the case. In twenty years the commutators have not lost more than 1½ in. (3.8 cm.) total diameter, and they seem to be good for many years more. In fact, a half hour's sanding barely removes the dirt and does not even remove entirely the brown gloss from the surface. The undercutting, however, shortened continuous operating periods down to six weeks and the machine would show distress at slight overloads. Different makes of brush and different modes of manipulation were used, but the trouble could not be eliminated without smoothing down the commutator. The reason that the undercut commutator is not very good is thought to be that the slot gets foul with carbon and copper dust and the tendency is to drag copper across the segments, making ideal short-circuit conditions. When an undercut commutator starts to give trouble there is no recourse but to shut down the machine, while on the other hand smooth machines under like conditions can always be brought back to good behavior by using sandpaper without reducing the load.

Another reason for the trouble with undercutting is that it is not mechanically correct to dig grooves across the wearing surface at right angles to the line of motion. It is thought that with a properly built and operated commutator high mica is non-existent. Soft mica, which is usually amber-colored, is the proper kind to use, and even the hard white mica will do if first split into thin sheets about the thickness of writing paper.

Knock Out the Potsdam Gang

SAFETY OF GROUNDED SECONDARY CONNECTION

Oscillograph Record Shows Effect of Contact Between Primary and Secondary Wires—Circuit Opened in Tenth of Second

The primary distribution system of the Madison (Wis.) Gas & Electric Company is three-phase, four-wire, 4000/2300-volts, with the neutral grounded. The neutral of the three-wire secondary is also grounded. The following experiment was conducted by George E. Wagner, superintendent of plant, and Prof. Edward Bennett at the University of Wisconsin to determine

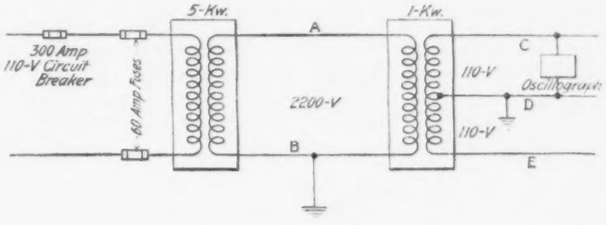


FIG. 1.—CONNECTIONS FOR TEST

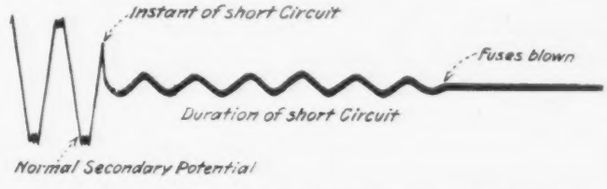


FIG. 2—VOLTAGE RECORD DURING SHORT-CIRCUIT TEST

Effect of a short circuit between a primary phase wire and a secondary line wire with the primary and secondary neutrals grounded.

the effect of short-circuiting the primary through the secondary on such a system. The current was stepped up to 2200 volts from 110 volts by means of a 5-kw. transformer, and a 1-kw. transformer was used to represent the distribution transformer. The connections were made as shown in Fig. 1. The result of bringing the ungrounded side of the primary (*A*) in contact with one of the ungrounded legs (*C* or *E*) of the secondary is shown in the oscillograph record in Fig. 2. At the instant of short circuit the potential dropped to a low value and continued for about one-tenth of a second before the fuses blew. From this it was concluded that the grounding of the secondary protects it from excessive voltage.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

STRICT CURTAILMENT OF CARBON-LAMP RENEWALS

Hartford (Conn.) Company Outlines Policy Adopted Which Enables It to Follow Out Fuel Administration's Recommendation

As a further step toward fuel conservation, the Hartford (Conn.) Electric Light Company has recently established a rule to the effect that it will neither renew free nor sell carbon incandescent lamps for replacement service without a written order from the Connecticut Fuel Administration, as reproduced. The Fuel Administration desires that the use of all carbon lamps not absolutely essential be discontinued.

CARBON LAMP REQUISITION

Date.....

The Hartford Electric Light Co.,
266 Pearl Street, Hartford, Conn.

Kindly furnish.....carbon lamps which will be used only where Mazda Lamps are not suitable.

Mazda Lamps are not suitable to replace same for the following reasons:

.....

.....

.....

Signed .....

Approved:
FUEL ADMINISTRATION FOR HARTFORD

By .....

NOTICE—The Fuel Administration requests that the use of all Carbon Lamps, not absolutely essential, be discontinued.

H. E. L. 818A

A WRITTEN ORDER MUST BE PRESENTED BEFORE CARBON LAMPS WILL BE FURNISHED

The company's policy, which is in line with the Fuel Administration's recommendations (see ELECTRICAL WORLD, Sept. 7, page 457), now is to eliminate all round-bulb and ornamental carbon lamps and all 60-watt and 30-watt carbon lamps, replacing the latter by 50-watt and 20-watt tungsten lamps, which of course give a much better illumination besides economizing in the consumption of energy and fuel. In places where excessive vibration occurs, as on some classes of machine tools, the retention of carbon lamps is permitted, subject to the approval of the Fuel Administration. Hand lamps and stage lamps in theaters are allowed to be of carbon in order to obviate the excessive breakage that might take place if tungsten lamps were used. At Hartford, as elsewhere, carbon lamps are often improperly used in the following applications which are now subject to revision: Residences, by force of habit; on account of free renewals, in stores and residences; in sign and advertising lighting, in hall lighting, and in general factory illumination. The company is pointing out that the change to tungsten lamps is to the financial advantage of the customer.

Chase the Hun Home—Buy Bonds

NEW WORK OPENING UP TO THE COMMERCIAL MAN

How He Is Helping His Company to Get Capital, to Get Increased Revenue and to Deliver Its Power Where It Will Do Most National Good

Selling stock in the home territory and negotiating loans from prospective customers have become important war-time duties of some central-station commercial men. The former is a campaign activity not unlike in its general features any common pre-war new-business campaign. Into this work the commercial man fits naturally. Negotiating loans from prospective customers is a somewhat different problem. Formerly when a coal-mine owner asked the power salesman if he could buy central-station power the answer was an unqualified "Yes," and then there was cause for general jollification. But now the answer is "Yes, if you will loan us the money to make the necessary extension." Instead of a jollification, then there generally must follow an explanation of the central station's lack of capital and the underlying reasons for this deficiency. An agreement must be reached as to the terms on which the loan is to be accepted and refunded. If the operating ratio of the company is 75 per cent, it is a common practice to return the loan with interest at 6 per cent to the customer by rebating 25 per cent of each of his bills. This in effect permits the company to finance its extensions out of the earnings from them and to meet its bills for construction material promptly. In explaining this situation to prospective power customers and conducting the necessary contractual relations the commercial man is doing a new sort of work.

Another phase of his new job is getting more revenue

for the company through increased rates. A manager of a large property recently remarked: "The commercial man who can figure out a method of increasing a rate is a whole lot more popular around the office than one who brings in a contract for a large piece of new business. With us," he concluded, "a dollar's worth of increased revenue is felt to be equal to about $20 worth of new business with its attendant capital requirements."

This means that the commercial man's new job requires him to study the method and manner of thinking of the regulatory body under which his company operates. He must know how its members feel not only on the question of amount of increased revenue but also on the topic of rate structures. This is necessary if the company is to expect prompt relief when its rate cases are filed.

While the above-named duties carry only indirectly war-time responsibilities, the commercial man engaged in power sales may have work to do in rationing power to the company's industrial customers which is of direct national importance. Upon his intimate knowledge of the importance and quantity of each respective customer's products largely depends the just and equitable distribution of the company's limited supply of power in times of shortage. The necessity for rationing power usually occurs on short notice, so the company in its preparedness for the emergency is prone to rely on the alert commercial department.

Money Means Munitions—Buy Bonds

FLAT-RATE CUSTOMERS CHANGED TO METER BASIS

New Orleans Investigation Shows that Customers, Besides Misusing Privilege, Pay Much Less for Energy Used than They Would at Regular Rates

Not only must strict economy be practiced to-day in every branch of utility operation but strict attention should be given to average rates for individual services to make sure that the income of the utility is as large as it ought to be. In this class falls the flat-rate customer. W. J. Aicklen, Jr., general manager of the Consumers' Electric Light & Power Company of New Orleans, La., has been checking up the income from flat-rate customers and has found that by changing over to meter service the average revenue for this class of customer can be considerably increased. These flat-rate customers are all connected through load-limiting devices.

A campaign for this class of business was started in the early part of 1913, and through wiring campaigns, etc., about 900 such customers were connected to the company's lines.

In the course of this campaign contracts were made with barber shops, saloons, pressing shops, residences, etc., all at the rate of 1 cent per connected watt, but after a little experience it was found that this did not pay, when compared with the regular rates. Consequently the rates for places of business were raised from 1½ cents per connected watt for pressing shops to 2 and 2½ cents per watt for saloons.

It was afterward found that even at these increased rates the company was often losing money, when compared with the retail lighting rates. These losses were not only due to the use of energy purchased by the customer for lighting with "mazda" lamps, but were also caused by the temptation that existed for the customer to use an electric fan without the knowledge of the company.

The company has had as many as twenty-five cases where the load limiter was practically destroyed through the customer using an electric iron or a toaster on a limiter with a capacity of only 100 watts. In fact, the average class of customer supplied on the flat-rate basis was found to be rather poor, and it was for this reason that there was so much of a tendency by customers to overstep the terms of their agreement with the company.

On tests made for this class of business, and in different localities, the company found that in a pressing shop paying $1.50 per month for 100 watts connected 34 kw.-hr. was used, which at the regular meter rate would amount to $2.24. At a grocery with a load of 200 watts and paying $2 per month it was found that 45 kw.-hr. was used in a month, which would amount to $2.90 per month at the regular rate. For a rooming house which was paying $4 per month for 400 watts connected a consumption of 76 kw.-hr. per month was found, which would amount to $4.50 per month at the regular retail rate. At another rooming house that was paying $2.60 per month for 260 watts connected was found a consumption of 49 kw.-hr. per month, which would amount to $3.10 at the regular rate.

It was such experiences as these that led the company to decide in 1915 that it would discontinue the installation of load-limiting devices for any new customers and that it would replace them with meters wherever there was an opportunity. For instance, if a customer moved from one address to another the company would refuse to move the limiter and would insist on a regular meter being installed. If the customer went out of business and was succeeded by another, the company refused to let the new customer have the excess indicator, insisting on installing a regular meter. This method reduced the number of load limiters to approximately 500 by the middle of 1918.

"As the load-limiter consumption has always been an uncertain quantity," Mr. Aicklen states, "and as it forms a large factor of uncertainty in the calculation of line losses, distribution losses, etc., the consideration of this, in addition to the facts that we had already learned regarding this class of business, caused us to decide to discontinue entirely all load limiters.

"As all these flat-rate contracts are written up on the yearly basis with a self-renewal clause, it was very easy to reclassify them into twelve monthly divisions, and to notify each division monthly of the expiration of their contracts, which were to be replaced on a meter basis or to be discontinued entirely.

"We have found that we have lost practically no business by this method, and even though we may not have so large a revenue on the meter basis, we will feel better in knowing that we are being paid for every kilowatt-hour sent out, and in creating so much larger a field for the exploitation of electrical appliances, as we have, of course, been restricted from selling any appliance to these flat-rate customers in the past."

TECHNICAL THEORY & PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Boiler Equipment of the Auzberg Power Station.—P. KOCH.—It was made a condition that the grates should burn Bohemian brown coal economically, and it was found by trial that the Piedbœuf chain grate was most suitable for this fuel. Four Burkhardt vertical-tube boilers are used, each of 400 sq.m. heating surface and designed for 15 atmospheres working pressure with superheater and wrought-iron economizer. Induced draft is provided, and the total grate surface of each boiler is 17.2 sq.m. Flue ashes are caught in special spirals and removed below the boiler-house floor. The wrought-iron chimney is 29.5 m. high and of 1500 mm. internal diameter. Butterfly plates below the grate cut the air supply from part of the grate area at times of light load. Performance data are included.—*Science Abstracts, Section B*, July 31, 1918. (Abstracted from *Zeits. f. Elektrot.*, 11, "Maschinenbau," March 31, 1918.)

Calculation of Performance of Induction Motors Working in Conjunction with Flywheels and Slip Regulators.—HERBERT VICKERS.—The author deals with the subject mathematically, taking the two cases of continuous-slip regulator and intermittent-slip regulator; also the automatic-slip regulator and the Ward Leonard system. Numerical examples are given. It is the purpose of the article to consider the relative proportions of flywheels and motors.—London *Electrician*, July 19, 26 and Aug. 2, 1918.

Lamps and Lighting

Recommendations on Economy in Lighting.—A discussion on how to effect economies by ascertaining the past consumption, avoiding waste of light in selecting lamps, using properly designed shades, globes and reflectors, keeping lamps and illuminating accessories clean, noting where the illumination is excessive and burning only those lamps which are strictly necessary. In the appendixes of this paper recommendations for the adequate lighting of factories and workshops engaged on work of national importance are contained, with a table giving the minimum illumination on work and the consumption of electricity per thousand square feet of working area for different classes of work.—*Illuminating Engineer*, May, 1918

Properties and Characteristics of Wire Lamps.—A discussion of the different kinds of filament-type lamps in respect to where the material is obtained and how it is prepared for use in lamps is given for tungsten, tantalum and osmium.—London *Electricity*, June 14, 1918.

Generation, Transmission and Distribution

Localization of Faults on Broken Three-Phase Cables.—L. LEVIN.—The position of a fault in a three-phase cable may be determined, when one or more cores are broken, by comparison of the capacity of the individual cores, provided that none of them are earthed. But it often happens that at the moment of interruption of the second phase of a three-phase cable the arc set up melts the copper or chars the insulation so that one or more cores in each of the two portions may be earthed. Several cases are worked out mathematically, the position and size of the fault being calculated. If all the cores in one portion *BC* are earthed and none in the other half *AB*, then, as is known, the determination of the position of a fault is achieved by measurements of the capacity of an unearthed core in *AB* and comparison of the value obtained with the capacity per kilometer given on the test sheet of the cable. Since this value varies according to the number of cores earthed, it would be very useful if cable makers would state on their test sheets all three values of the capacity, *i.e.*, C_1 when no cores are earthed, C_2 when one core is earthed and C_3 when two cores are earthed.—*Science Abstracts, Section B*, July 31, 1918. (Abstracted from *Elektrot. u. Maschinenbau*, May 5, 1918.)

National Electricity Supply.—The linking up of power systems in south Wales and Monmouthshire, England, is discussed extensively, a map being given showing the problem involved.—*Electrical Times*, June 13, 1918.

Synchronizing of Alternators.—E. STYFF.—An abstract of an article in the *Elektrotechnische Zeitschrift* explains the mathematical theory of synchronizing and gives tables showing the phase displacement with relation to the deflection of instruments with lamps bright, dark and with mixed connection.—London *Electrician*, Aug. 2, 1918.

Use of Lignite, Bagasse and Wood Waste for Power Generation and Other Purposes.—JOHN B. C. KERSHAW.—Chemical and physical properties of lignite and power generation from air-dried lignite are discussed. Methods of briquetting are also outlined and the sectional elevations of boilers and fnrnaces for burning lignite are illustrated.—London *Engineer*, Aug. 9, 1918.

Wiring and Equipment for Radio Instruction.—W. HAYNES.—This article is written for the particular attention of Y. M. C. A. radio schools and for other agencies of instruction for radio work in the army. The difficulties of the present methods used are discussed, together with the improved system. This article is written in a simple manner and can be understood by non-technical men who wish to learn quickly the theory of wireless telegraphy.—*Journal of Electricity*, Aug. 15, 1918.

Use of High-Pressure and High-Temperature Steam.—J. H. SHAW.—The author considers the results of using high-pressure and high-temperature steam in power houses, and presents data showing the effect on efficiency and coal consumption for a wide range of

conditions. Some modifications in boiler design resulting from such higher temperatures and pressures are discussed.—London *Electrician*, Aug. 16, 1918.

Installations, Systems and Appliances

Cable Section for Intermittent Load.—The problem attacked is the determination of cable cross-section required for intermittent operation, particularly in hoist service.—*Science Abstracts, Section B*, July 31, 1918. (Abstracted from *Brown-Boveri Mitteil.*, 4, No. 9, 1917.)

Electric Welding as Applied to Steel Ship Construction.—H. G. KNOX and W. L. MERRILL.—Various kinds of welds used in ship construction are described and fully illustrated. Arc welding, arc-welding tools, choice of current, distribution systems, holders, masks, spot welding and spot-welding tools are also considered. Other phases of this subject will be discussed in future issues of the journal.—*Journal of Engineers' Club of Philadelphia*, September, 1918.

Theory of the Static Frequency Doubler.—M. OSNOS.—The action of the static frequency doubler is based upon the superposition of a steady field upon an alternating field. The apparatus is shown in its simplest form and the theory of operation is discussed in full. It was shown that for a constant sum of the alternating and continuous current ampere turns the secondary flux has its greatest value if the ratio of the maximum value of the alternating-current to the continuous-current ampere-turns is equal to two. In this article a graphical construction is given by which the maximum value of the primary and secondary fields may be determined. From this construction it is also possible to obtain the ratio between the primary and secondary voltages. This ratio is also obtained by calculation, and the results are confirmed by calculations from a special case, taking as a basis the saturation curve of a particular sort of transformer iron.—London *Electrician*, July 19, 1918. (Abstracted from *Electrot. Zeits.*)

Copper Economies in Austria.—F. SABESTSCHING.—A demand was made by the government for some of the copper and lead (11 tons of the former and 8 of the latter) used on an electric line, 13 km. long, between Bludenz and Sckruns in the Montatoner valley. This could be done either by raising the voltage, which was considered impossible owing to the existing motor equipment, or by altering the method of supplying the line with power. Hydroelectric power was supplied from a point about 800 m. from one end of the line, and it was found that the required saving could be effected, without detriment to the working, by transmitting this power to a point near the middle of the line, where a substation for transforming purposes has been erected.—*Science Abstracts, Section B*, July 31, 1918. (Abstracted from *Elektrot. u. Maschinenbau*, April 7, 1918.)

Electric Winding Engines and Mine Hoists.—H. H. BROUGHTON.—In the first part of the article a convenient practical method of drawing the torque diagram is described. The method, which is used by the author for all cylindrical-drum winders, leads to the rapid determination of the cardinal points of the diagram. The distorting effect of heavy ropes is briefly considered, and diagrams are given for the unbalanced cylindrical-drum winder and for the balanced winder with tail rope.—London *Electrician*, Aug. 23, 1918.

Electrophysics and Magnetism

Contribution to the Quantum Theory of Paramagnetism.—F. REICHE.—A mathematical paper. The kinetic theory of paramagnetism of Langevin led to Curie's law that the molecular susceptibility is inversely proportional to the absolute temperature. Onnes and Oosterhuis, however, showed that this law did not hold at very low temperatures. The problem of setting up a theory of paramagnetism on the basis of the quantum hypothesis has been taken up by Oosterhuis and Keesom, Gans and Weyssenhoff. The theory of the last-mentioned author employs fixed axes of rotation; in the present paper an extension is made by the employment of free axes of rotation, *i.e.*, two degrees of freedom. Starting from the Jacobi-Hamilton equation, the quantum conditions are introduced and an expression is obtained for the molecular susceptibility. This is considered in the light of particular cases. Further, the calculated values of the susceptibility for various substances are compared with the experimental results of Onnes and Oosterhuis, good agreement being obtained.—*Science Abstracts*, July 31, 1918. (Abstracted from *Ann. d. Physik*, March 21, 1918.)

Potential Distribution in String Insulators.—H. SAEGUSA.—This is a mathematical discussion of the distribution of potential along a string of suspension insulators with capacity between one another and between each insulator and the earth.—*Science Abstracts, Section B*, July 31, 1918. (Abstracted from *Tohoku University Scientific Reports*, April, 1918.)

Electrochemistry and Batteries

Relation Between Specific Inductive Capacity of an Electrolyte and Electric Potential of a Metal Placed in It.—DAYTON L. ULREY.—The potential difference between electrodes of the same kind in a two-solution cell has been measured for a number of different percentage mixtures of two liquids for four different cases, and in each, after disturbing influences were removed, is shown to be strictly proportional to the difference in the specific inductive capacities of the two solutions. In the two cases investigated with copper electrodes, one with platinum and six with calomel electrodes, the direction of the electromotive force of the cell is in accordance with the theory that the loss of the ions from an electrode is dependent upon the specific inductive capacity of the electrolyte rather than upon the concentration of those ions in the electrolyte and a solution tension of the electrode.—*Physical Review*, July, 1918.

National Physical Laboratory (Great Britain) in 1917-18.—This paper consists of a report on the work in progress and the accomplishments of the National Physical Laboratory. Among the subjects of especial interest to electrical engineers are fundamental electrical units, magnetic disturbances of the laboratory, general electric measurements, electrotechnics, continuous-current resistance, buried cables, pyrometer tubes, thermal conductivity, electric hot plates and cold storage.—London *Engineering*, Aug. 2, 1918.

Units, Measurements and Instruments

Production of High Temperature and Its Measurement.—E. F. NORTHRUP.—The author takes up the difficulties involved in the general problem and then describes apparatus developed by him in which the method of oscillatory current obtained from the discharge of

condensers is employed. These oscillatory currents pass through an inductor coil of about fifty turns which surrounds the crucible, being sufficiently separated from it to permit of both electrical and heat insulation. It is thus a Tesla coil arrangement in which the voltage is lowered and the current raised. These furnaces have been made and tested in units up to 50 kw. and 60 kw. The writer also describes a pyrometer which depends for its indications upon the linear expansion of tin. The instrument is constructed on the general lines of a large mercury thermometer.—*Transactions* of the Faraday Society, June, 1918.

Chart for Oscillation Frequency and Wave-Length of Oscillatory Circuits.—P. Luckey.—(Similar article by A. S. M. Lorensen.) Gives a diagram from which the oscillation frequency and wave-length of an oscillatory circuit of given capacity and self-induction may be found. The chart is based on the logarithmic relation $\log \lambda - k = \frac{1}{2}(\log L + \log C)$.—*Science Abstracts, Section B*, July 31, 1918. (Abstracted from *Jahrb. d. Drahtl. Tele.*, April, 1918.)

Pyrometer Standardization.—Ezer Griffiths and F. H. Schofield.—In this paper the writers discuss the sources of error, limitations and calibrations of thermo-electric, resistance, radiation and optical pyrometers.—*Transactions* of the Faraday Society, June, 1918.

Automatic Control and Measurement of High Temperatures.—Richard P. Brown.—In order to make action more positive than that obtained by merely making contact through the pointer of a millivoltmeter, the automatic control pyrometer described here operates in the following manner: A thermocouple formed of a nickel-chromium alloy, installed in the electric furnace the temperature of which is being controlled, actuates a high-resistance millivoltmeter. Below the pointer, and adjustable throughout the whole scale range, is a table carrying two contact pieces, separated by a thin piece of insulating material $\frac{1}{32}$ in. (0.8 mm.) thick. The depressor arm, which is driven by means of a small electric motor, or by a clock if that method be preferred, depresses the pointer at regular intervals, usually every ten seconds, and in doing so the pointer forces together the two contact pieces below.—*Transactions* of the Faraday Society, June, 1918.

Telegraphy, Telephony and Signals

Limit of the Increase in Transmission Range Obtained by Loading.—H. Jordan.—By transformation of the expression for the attenuation constant the influence of the coil-loss angle and the dielectric-loss angle on the transmission is brought out. With given coils and dielectric the value of the self-induction for minimum attenuation is determined, giving the maximum speech range. The ratio between this and the range of the unloaded cable is the maximum improvement factor and is shown to be dependent only on the sum of the coil-loss and dielectric-loss angles, and independent of the resistance and capacity of the cable. In the case of the open line it is necessary to separate the added inductance from that inherent in the line. The dielectric-loss angle loses its physical significance, since the leakance is due to the insulators. The results for the open line are, however, similar to those for cable.—*Science Abstracts, Section B*, July 31, 1918. (Abstracted from *Elektrot. Zeits.*, Feb. 14, 1918.)

Constants of Radio-telegraphic Stations.—M. Dieckmann.—At present there is a lack of simple characteristic constants to define the power of sending and receiving stations in wireless telegraphy. The usual method of defining the antenna of a sending station is by the number of watts calculated from the antenna current and antenna resistance. As this does not take any account of the radiating properties of the antenna it does not lead to a means of calculating the range of the station. In the case of receiving stations only figures of the most general kind are generally given. The author proposes a system of constants that he has devised in a series of experiments with the help of Zeppelin airships.—*Science Abstracts, Section B*, July 31, 1918. (Abstracted from *Jahrb. d. Drahtl. Tele.*, 12, April, 1918.)

Miscellaneous

Tariffs for Interconnected Three-Phase Generating Stations.—H. Bussmann.—The satisfactory operation of several three-phase generating stations in supplying a common distribution network depends so closely on adjustment of the power factor that it is desirable to institute a system of payment to each station for the energy supplied from it in a manner that takes account of the wattless power. Such an arrangement, adopted by the Rhenish-Westphalian Electricity Works, is described.—*Science Abstracts, Section B*, July 31, 1918. (Abstracted from *Elektrot. Zeits.*, March 7 and 14, 1918.)

Aluminum Deposits and Production of Aluminium.—Although it is impossible at the present moment to forecast the effect of the war upon many industries, it is clear that the shortage of copper has greatly extended the use of aluminum, and that not merely temporarily. The production has in consequence increased and a number of important aluminum works have been and are being started in different countries. Under these circumstances a survey of bauxite deposits, and more especially the less known ones, and a description of the development and present state of the processes of production is here undertaken.—London *Engineering*, Aug. 16, 1918.

Electrical Reconstruction in Belgium.—A map produced in the article shows that as many as twenty-six important power stations were in existence in Belgium before the war. It is thought that generation of electricity should be concentrated at the ports of Ostend, Ghent and Antwerp and at the coal pits of Mons, Charleroi, Liège and Limburg. It is estimated that if the railway network were completely electrified the maximum demand for power would not exceed 250,000 kw. If all the industries were supplied with electrical energy for motive power, something like 500,000 kw. would be required. Therefore, providing for a future growth for five or ten years, about 1,250,000 kw. ought to be provided in the superstation system. Saving of coal is discussed and the effect of development of electricity shown. It is thought that instead of one big power house of 100,000 kw. to 300,000 kw. there should be many big power stations using surplus heat from blast furnaces and all kinds of plants, as far as possible, linked up in the industrial district so as to concentrate in the one system of the industrial district all of the supplies of electrical energy that are available.—London *Electrical Review*, Aug. 2, 1918.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

ELECTROCHEMICAL SOCIETY HOLDS GENERAL MEETING

Symposium of Papers and Discussions on Problems in the Electrochemical Industry That Will Demand Solution After the War

The thirty-fourth general meeting of the American Electrochemical Society, which had been scheduled to convene at Princeton University, was held at Atlantic City, N. J., Sept. 30 to Oct. 2, owing to the fact that the government was obliged to make use of all of the facilities at Princeton.

The American Electrochemical Society is the first of the national organizations to give consideration to post-war problems within the industry which it represents. A symposium on this subject was the feature of the meeting and occupied the program for an entire day. In general, the meeting was without social features being devoted entirely to the consideration of technical problems.

After-the-War Problems Discussed

In the symposium on electrochemistry after the war a number of experts discussed the most obvious problems. Chief among these is the future of electrolytic chlorine, which has been produced in quantities far exceeding the normal demand. A. H. Hooker, who led the discussion, was of the opinion that new uses must be found for chlorine if the present plants are to be kept in operation. By way of emphasizing the possible uses of chlorine, Dr. Van R. Kokatnuf gave an exhaustive review of the commercial applications of the element. Apparently, the largest possible use of chlorine is in the treatment of ores. This would consume it in large tonnages.

Next to chlorine there is a large problem in the nitrogen industry after the war. W. L. Landis showed that the country has a capacity for nitrogen fixation which is beyond its apparent needs, but he was hopeful that the demand for fertilizer in more concentrated form would afford a market for the entire product.

The power situation after the war was discussed by C. A. Winder. He was rather skeptical about the so-called super-steam plant which has been proposed for the coal fields in capacities up to 500,000 hp. The quantity of water available for condensing purposes would be a limiting factor. Mr. Winder saw no such thing as surplus power and believed that there would be an ample market for all of the hydroelectric power in the country as fast as it could be developed. He was opposed to federal ownership of power plants, and in this was supported by all those who discussed the subject.

F. A. J. Fitzgerald discussed the electric furnace after the war and expressed the opinion that it would have more extensive use. J. A. Mathews expressed the opinion that electric steel would be produced in ever-increasing quantities and would make possible the wider use of better steel. Electric pig iron, in the opinion of Robert Turnbull, would not continue to be an important product after the war, when blast furnaces could supply the entire demand.

Col. W. D. Bancroft expressed some ideas on research work after the war. His subject was discussed by Dr. Mess. The gist of the discussion was to the effect that industry would profit by the establishment of coöperative research laboratories.

Tariff problems in the electrochemical industries were discussed by Dr. Grinnell Jones of the United States Tariff Commission, and the participation of technical men in government affairs was considered by F. A. Lidbury.

After the meeting the society visited the laboratory of the Pyrolectric Instrument Company at Trenton where a demonstration was made by Dr. Northrup of his high-frequency oscillatory current electric furnace.

Have You Bought Your Bonds Yet?

LIBERTY BONDS WILL KEEP THE LIGHT BURNING

War Convention of N. E. L. A. New England Section

Delegates Reaffirm at Springfield Meeting the Patriotic Pledge and Resolution of the National Association—Government Representatives and Members Discusss War Problems

MORE than 200 members and guests of the New England Section of the National Electric Light Association convened at Springfield, Mass., Sept. 27 and 28 to discuss war problems of the central-station industry. Mingled with the seriousness of the occasion was a sustained note of confidence in the rising tide of Allied victory and a consecrated determination to "go the limit" in supporting the cause of liberty.

The convention opened Friday morning at the Hotel Kimball with the singing of the national anthem, and the patriotic resolutions of the national association at the recent Atlantic City convention were unanimously reaffirmed and transmitted by telegraph to President Wilson. The convention was honored by the presence and addresses of representatives of the United States Fuel Administration and of the War Industries Board, and had there been no formal program of papers and discussions, these addresses and the opportunity the occasion afforded for personal interchange of ideas on questions of war import would have made the meeting memorable. Among the topics dealt with in papers and addresses were the government control of interconnected power systems, the use of women in the central-station industry, popularizing public utility securities, standardization of transformer ratings and designs, and coöperation of central stations and contractor-dealers for mutual advantage.

The President's Address

President Lisle's opening address was preceded by the reading of greeting telegrams, foremost of which was a message from President W. F. Wells of the national body pledging the organization to help in winning the war in every way within its power. With this as his keynote, President Lisle urged the membership to concentrate every energy and resource to this purpose, striving to coöperate to the utmost with the administration at Washington and to avoid looking at government policies and recommendations from any but the patriotic standpoint.

"Do not be afraid to ask Washington for help," said the speaker, "but be slow to ask industrial exemption for men not indispensable to the operation of plants. See if men with dependents cannot do the work nearly as well as those without them. Give until it hurts; go without something; lend your money to the government and then lend your credit! Read the electrical magazines. Take home their lessons and suggestions. Do not oppose daylight saving the year through, or the use of women and girls who want to do work which you thought was a man's. Put every effort into the cause and help win the war."

There are now 952 members of the New England Section, sixty-three having voluntarily joined this year, according to the report of the secretary, Miss O. A. Bursiel. The section headquarters has coöperated with Fuel Administrator Storrow of New England in many ways during the past year. In view of the demand for skilled labor a card file is now maintained at the Boston office, 149 Tremont Street, giving positions open and personnel available. The report of the treasurer, Bowen Tufts, showed the finances to be in a healthy condition.

The program at the first session included papers on "Finances," by E. A. Barrows, president Narragansett Electric Lighting Company, Providence, R. I., and one on "The Financing of Extensions," by R. S. Hale, superintendent special research department, Edison Electric Illuminating Company of Boston. The papers of E. W. Lloyd, Chicago, and Alex Dow, Detroit, on "Line Extensions in War Time," prepared for the recent Atlantic City convention of the association, were also read.

In the absence of banking representatives President Lisle also conducted an informal discussion upon "Trade Acceptances" at this session.

Mr. Barrows emphasized the importance of rates adequate to cover the very real risks of the central-station business as well as to meet operating expenses and fixed charges. By the maintenance of a fair dividend rate local capital is encouraged to flow into utility development, and growth is an essential to the rendering of service. The Narragansett company has paid 8 per cent (issuing stock at par) for thirty years, and the city and Public Utilities Commission recognize this rate as fair. Seventy-five per cent of central-station power is now devoted to war essentials, and the industry needs far more than the $400,000,000 a year estimated as necessary for expansion by Frank A. Vanderlip not long since. The speaker commended the helpful and efficient work of the Capital Issues Committee in conserving capital for essential purposes.

Government Control of Transmission Systems

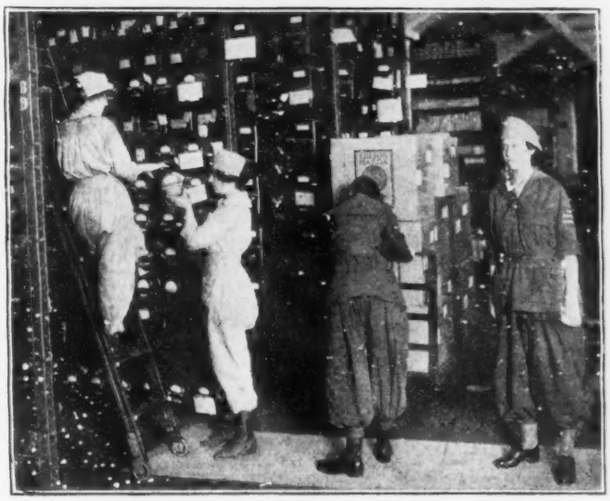
That government control and even ownership of large interconnected power supply systems is imminent unless such systems are operated so efficiently and on the whole so extraordinarily well that there would be no advantage in the change from the public standpoint was declared by Philip Cabot of Boston, president of the Turners Falls Power & Electric Company, at the opening of the afternoon session.

As a leading public utility banker and executive, Mr. Cabot pointed out that little more than a beginning has as yet been made in the way of comprehensive power development and system interconnection in New England from the standpoint of ultimate economic tests. He maintained that electric power is of the most fundamental industrial importance, that the demands of economical operation will relatively soon force the electrification of New England railroads, adding at least 300,000 kw. to the present central-station load and that small and inefficient steam plants will be discarded. The industrial load to-day, combined with the railroad and central-station loads, must exceed 3,000,000 kw. in New England, of which less than one-fourth is handled by central stations.

After outlining the economic need of tidewater sta-

tions of large size as the mainstays of a comprehensive system of supply, Mr. Cabot developed the thought that the supply of electrical energy for power is a prime function of government and that the great expansion before the industry will require and produce extension of government control until it is complete. Upon his attitude toward this development depends the future of the young man in the central-station field.

There was no discussion of Mr. Cabot's paper, but Bowen Tufts of C. D. Parker & Company, Boston, in opening remarks upon the sale of securities to customers, referred to Washington's enunciation of the principle that the true function of government is to govern rather than to own. Mr. Tufts pointed out that the day of autocracy is quickly passing and said that in the public utility business to-day there are few properties owned by capitalists. About 40,000 Massachusetts men



WOMEN AT WORK IN CENTRAL STATION

and women, for example, have put their savings into Massachusetts public utilities and should receive as much consideration as savings bank depositors. It is important, Mr. Tufts said, to show the public, at meetings bearing upon rate changes, who owns utility stocks and who holds company notes.

In a paper on "Raising Rates and Coal Clauses," R. S. Hale, Boston Edison company, outlined the limitations of coal clauses and war surcharges in the event of long-continued hostilities and corresponding price changes. Most of the companies during the first few months when costs rose went on the theory that the rise was temporary and that it should be taken care of through the reserves. Finally costs rose to a point where the reserves could not stand the strain and an increase in income became necessary. Coal clauses entered the rate structure, and these, combined with a war surcharge, temporarily care for central-station cost difficulties, particularly where the coal clause takes care also of other increasing operating expenses, collecting say 150 to 200 per cent of the increased fuel expense. In case the war is greatly protracted, a change in rates is likely to be required along the line of raising the prices for large power users to the increased cost of producing it in private plants under war conditions. Cooking business will probably thrive better without a raise in rates. Street lighting should be able to stand a raise unless political conditions interfere. Rates should not be raised to small customers until the limit has been gone with the large ones.

Success in selling public utility securities to the local public was described in a paper by Percy H. Whiting of the Central Maine Power Company. Sales were effected through vigorous newspaper advertising, especially in industrial towns handling intensive war work, shipbuilding, etc., and by selling to and through employees. Bowen Tufts also spoke briefly on this topic, stating that better results in selling such securities had been secured through the coöperation of local managers and subordinates than by experienced bond salesmen.

"The Employment of Women in Public Utilities" was the title of a paper by Charles H. Parker, superintendent of the generating department, Boston Edison company. An illustrated article on this topic, based upon Boston experience, was published in the ELECTRICAL WORLD of Sept. 21. The author brought out as additional information the fact that there are now seventy-nine women in the department and that on Sept. 10, 1918, 81.6 per cent of the company's employees, or 1595 out of 1955, were men, whereas on April 3, 1917, 91.4 per cent were men. Nearly every department has increased its quota of women, and the movement is still progressing. Written contributions on this topic were also presented from J. W. Cowles, superintendent of the department of installations, and W. F. Stevens superintendent of the supply department, Boston.

The final paper in the afternoon session was on "Wholesale Power," by F. P. Royce of the Stone & Webster organization, Boston. The author reviewed the principles underlying the application of wholesale power rates and emphasized the importance of drawing large power contracts with extreme care.

FUEL SAVED MEANS DECREASED CASUALTIES

"In so far as we fall short in fuel saving it will be reflected in increased casualties," declared Howell Van Blarcom, assistant chief of the power and light section, United States Fuel Administration, Washington, in an address upon coal conservation at the evening session on Friday. The speaker contrasted the enormous consumption of munitions to-day with that of entire wars in the past and showed the close connection between savings in coal behind the lines and decreased casualties.

Mr. Van Blarcom said that the country faces a shortage of probably 50,000,000 tons of coal this year, the estimated total requirements being 673,000,000 tons. The demand for steel is the chief cause of the present enormous fuel consumption. In the entire Franco-Prussian War the Germans fired only 650,000 shells, whereas in the recent secondary engagement at the St. Mihiel salient 1,500,000 shells were used by the attacking armies. In the Flanders drive last spring the Huns fired more than half a million shells in seventy-eight minutes, and at the siege of Verdun the French used no less than 60,000,000 shells, which consumed 1,800,000 tons of steel and required 9,000,000 tons of coal in their making.

"To-day we have probably not over 650,000 miners at work in this country," said the speaker, "but the American miner produces more than twice as much coal as his British brother. Twenty-one million tons of steel is needed for the present quarter year, and 17,000,000 tons

is the greatest production which we can hope for. We must conserve in every possible way. The central station is of inestimable value to the government in the conservation of fuel. New England is probably further ahead in this work than any other section.

"The Fuel Administration is about to embark upon a program of economy promotion which should be most effective. Ice-making plants not fully loaded are to be gradually closed down and the load transferred to installations which can be operated at maximum efficiency. Elevator service in apartments and hotels will be curtailed, and 'skip stops' will be applied to their maximum usefulness on electric railways. There must be a closer curtailment of lighting, and heat regulation must be run within sharper limits. Practically every boiler plant in the country is to be inspected by a representative of the Fuel Administration and rated upon the basis of data obtained. The best boiler rooms will be the last to feel the effects of fuel curtailment. It is estimated that 4,000,000 tons of coal can be saved per year by discontinuing the manufacture of carbon and metallized-filament lamps. Interconnection is being encouraged and inefficient isolated plants are being hunted down. Central stations are urged to take over isolated-plant loads in the summer season particularly, at least for the war period."

In closing, the speaker vigorously affirmed the coming of a victorious spring and urged the utmost conservation of fuel as a means of bringing the supply of munitions closer to the needs of General Pershing's forces and thereby increasing their power of advance with minimum losses of men. Much applause followed Mr. Van Blarcom's address.

LABOR MUST BE GAINED THROUGH PLANT CONVERSION

Labor shortage and the problem of overcoming it were discussed by the next speaker, Leonard W. Cronkhite, head of the resources and conversion division, regional adviser's office, War Industries Board, Boston. Mr. Cronkhite outlined the need for men in the army and navy, in the shipbuilding and munitions plants and food supply of the nation. In this country there were about 33,000,000 male workers in 1917. Not less than 5,000,000 are needed for the fighting forces on land and in the air; the navy and shipping service require 750,000; shipbuilding, 750,000; munitions plants, 1,500,000, and food production, 11,000,000. All in all, about 7,000,000 are now left to do the work of 22,000,000. To-day twenty great war plants are short by 50,000 unskilled workers alone, and in the country as a whole 878,000 unskilled workers were needed on Oct. 1.

The speaker touched upon the importance of adequate appropriations for housing and on the possibility of increasing the productiveness of labor through supervision of unskilled by skilled workers, appeals to patriotism, the use of women, substitution and conversion of plants for work on war necessities, and labor dilution. Hundreds of conversions have been accomplished; thus, to cite a few, a stove plant is making locomotive parts; a terra-cotta factory, dummy drop bombs; a corset factory, medical and surgical belts; a shirtwaist factory, signal flags. The speaker closed with a powerful plea to heed the lessons of the war in future work.

The last speaker of the evening was W. H. Blood, Jr., assistant to the president of the American International Shipbuilding Corporation, who gave an illustrated talk on Hog Island shipbuilding activities which was received with great enthusiasm.

At the session of Saturday morning President Lisle called upon Executive Secretary T. C. Martin of the national association to address the convention. Mr. Martin referred briefly to the fuel conservation problem as affected by the exclusion of carbon and "gem" lamps from the general market, urging the coöperation of members in this and other conservation measures adopted on behalf of the country's war program. He touched upon the importance of paper conservation

PRESIDENT-ELECT LELAND

and instanced the reduction of the N. E. L. A. *Proceedings* from 2000 to 500 pages this year and of the *Bulletin* from 64 to 48 pages. He then introduced the resolution of loyalty adopted at the Atlantic City convention last spring, and it was reaffirmed unanimously for transmission to the President.

Increases in wages, standardization of transformer ratings, the effect of daylight saving on central-station income, bonus systems and stimulating appliance sales were the topics of the morning session. The principal speakers were E. F. Lawton, Hartford, Conn.; F. H. Smith, Worcester, Mass.; W. R. Eaton, Cambridge, Mass.; M. O. Troy, Pittsfield, Mass.; Eugene Carpenter, Newton, Mass., and I. A. Honnewell, Lowell, Mass.

Special interest was aroused by the paper of Mr. Troy, which showed how the reduction of transformer types, sizes, etc., may be effected as an aid to economy in labor and material under war conditions. Quantity production and the concentration of designing and manufacturing effort to a limited range of activity are necessary for maximum efficiency in the use of material and labor to-day. More than a million designs were possible when the apparatus committee of the N. E. L. A. and the transformer committee of the Power Club completed the initial task of reduction summarized in the printed report now available, a task greatly aided by the engineering work of the standards committee of the A. I. E. E.

At the closing session on Saturday afternoon John J. Gibson, manager supply department, Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., outlined a paper on "Making Quantity and Service the

Basis of Price" contributed to *Electrical Merchandising* by him recently. W. L. Goodwin addressed the convention on "Coöperation Between Different Branches of the Industry," urging that central stations conduct their retail sales departments on the same basis as the retail departments of contractor-dealers' organizations.

The officers elected for 1919 were: President, George B. Leland, Stamford, Conn.; vice-president, Clifton R. Hayes, Fitchburg, Mass.; treasurer, Bowen Tufts, Boston; executive committee, F. D. Gordon, F. A. Belden, H. L. Olds, W. L. Mulligan, R. C. Brooks, E. F. Lawton and A. B. Lisle. W. L. Mulligan, Springfield, was chairman of the convention committee.

PRESIDENT-ELECT LELAND

George B. Leland, the president-elect, is general manager of the Stamford (Conn.) Gas & Electric Company, with which he has been associated for the last fourteen years. He was born in Johnson, Vt., and was educated in the local schools, working on his father's farm during the off-school periods until he became of age. Mr. Leland then was employed in a shop at Erving, Mass., and shortly afterward was appointed chief engineer and electrician in the Connecticut Industrial School for Girls, at Middletown. He entered the central-station field later as day engineer for the Middletown Electric Light Company and was soon promoted to the post of chief engineer. Here he had about seven years' experience in all branches of central-station work, including both inside and outside service. From Middletown Mr. Leland entered the field of construction in the employ of Sanderson & Porter. He was engaged in the erection of a generating plant at Far Rockaway, L. I., and upon its completion operated it as chief engineer for three years, leaving it to become superintendent of the Norwich (Conn.) Gas & Electric Company. Upon the municipalization of this system Mr. Leland became superintendent of the Stamford company, and early this year he was made general manager.

Mr. Leland is an associate member of the American Institute of Electrical Engineers, chairman of the Connecticut Electric Light Association, and is a member of the Connecticut Get-Together Club of the N. E. L. A., having served as chairman for one year. He is an inspector in the conservation division of the United States Fuel Administration under C. G. R. Corson of Hartford, Conn. He will take office as the head of the New England Section on Jan. 1.

Bonds Are as Necessary as Bombs

FORM THE STUDENTS' ARMY RESERVE CORPS

At More than 500 Universities and Colleges 150,000 Students Are Mustered Into the National Military Service

On Oct. 1 150,000 students at more than 500 colleges and universities in all sections of the country were mustered into the Students' Army Reserve Corps. They become a part of the military forces, pledged to the defence of the nation.

Special programs were arranged at the different institutions, and messages were read from President Wilson, Acting Secretary of War Crowell and General March, chief of staff.

EMERGENCY POWER ACT PASSED BY THE HOUSE

Representatives Approve Without a Dissenting Vote the Appropriation of $175,000,000 for War Power-Plant Construction

Without a dissenting vote the House of Representatives passed on Oct. 1 and sent to the Senate the government emergency power-plant act.

The bill as reported reduces the amount of the appropriation from $200,000,000, named in the original draft, to $175,000,000, "to be available during the time this act is in effect."

Chase 'em to the Rhine—Buy Bonds

PLANS FOR INTERCONNECTION OF POWER PLANTS AT SEATTLE

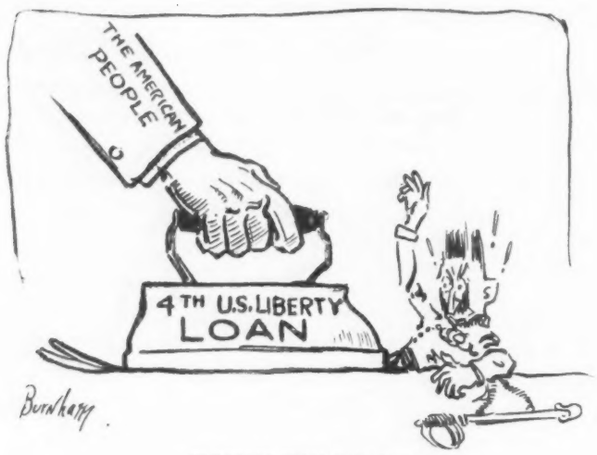
Estimated Cost of Tying Together the Company and Municipal Systems Is $60,000—Output of Combined Plants

J. D. Ross, superintendent of the Seattle city light department, and Councilmen R. H. Thomson and O. T. Erickson are conferring with officials of the Puget Sound Traction, Light & Power Company to work out a plan for interconnection of the traction company and municipal power plants. The estimated cost of the connection will be about $60,000.

One of the conditions on which the Capital Issues Committee authorized the city to issue $5,500,000 bonds to build the Skagit River power plant was the connection of the two power plants to reduce duplication of service and give a maximum efficiency for both plants. The War Industries Board has made a demand for quick action on the connection to insure uninterrupted power for Seattle war industries.

Superintendent Ross says that the combined traction and municipal plants will represent a capacity of about 140,000 kw. The city plant has a normal capacity of 30,000 kw., and the traction company plants in the Seattle district, including Tacoma, Kent, Auburn and Seattle, have a combined normal capacity of 110,000 kw. The traction company already has a connection with the Tacoma municipal power plant, with a rating of about 30,000 kw. The Seattle connection will unify the three plants in one system.

At a recent conference of Mayor Ole Hanson and the finance committee of the city of Seattle it was decided to place the first issue of Skagit River power bonds, aggregating $1,500,000, at once, if no objection is raised by the Capital Issues Committee. The quick action will be taken to issue the bonds before the proposed revenue tax is enforced. The only thing that now stands against the issuance of the securities is a "gentlemen's agreement" between Mayor Hanson and members of the Capital Issues Committee by which it was agreed that the issuance of the bonds would not be permitted to conflict with the fourth Liberty loan. Carstens & Earles, brokers, who have offered to take the Skagit first issue, have agreed to keep the bonds off the market until after the Liberty loan campaign is completed, and it is expected that this arrangement will meet with the approval of the Capital Issues Committee.



ELECTRIC-IRON HIM OUT

INDIVIDUAL PLANTS ON PREFERENCE LIST

Circular No. 20 of the Priorities Division of the War Industries Board Lists Plants by States

Circular No. 20 of the War Industries Board, Priorities Division, comprises preference list No. 2, issued Sept. 3, 1918, superseding preference list No. 1, issued April, 6, 1918, and all amendments and supplements thereto. It includes a classification of individual plants, listed alphabetically by states.

Buy and Keep the Liberty Bonds

CONSERVATION SCHEDULE FOR ELECTRIC HEATING APPLIANCES

Program of Elimination of War Industries Board to Conserve Materials and Labor, to Free Capital and to Simplify Production

B. M. Baruch, chairman of the War Industries Board, authorizes the following:

The Conservation Division of the War Industries Board, applying its program of eliminations to conserve essential materials and labor, to free capital tied up unnecessarily in manufacturers' and merchants' stocks and to simplify factory production, has issued a schedule for manufacturers of electrical heating appliances which calls for discontinuance of the manufacture of the following electrical utensils and appliances:

Carburetor heaters, hand-wheel heaters, intake heaters, manifold heaters, primer heaters, blankets, robes, cigar lighters, frying pans, plate warmers, curling irons, sauté pans, waffle irons, fluting irons, egg boilers, soup kettles, stew pans, corn poppers, hand dryers, hosiery forms, peanut roasters, transfer irons, vaporizers, varnish sprayers, entrée dishes, cigar lighters for automobiles, book-binding appliances, instantaneous water heaters, automobile foot warmers, fudge warmers, vegetable dishes and all Sheffield plated ware.

The schedule for domestic appliances (660 watts or less, except ranges) provides:

All appliances that are to be eliminated but which are now in the process of manufacture or are completed and in stock may be sold, but no more material for any of these appliances is to be purchased except to balance up stocks on hand, and their manufacture is to be discontinued entirely Dec. 31, 1918.

In no case is any manufacturer to add to the number of styles and sizes that he is now making.

Each manufacturer of the following appliances is to restrict his output to the number of styles and sizes specified:

	No. Styles	No. Sizes		No. Styles	No. Sizes
Chafing dishes	3	1	Toasters	2	1
Percolators with faucets	3	2	Toaster stoves	1	1
Percolators without faucets	3	2	Convector heaters	1	1
Samovars	1	1	Disks Stoves	2	2
Nursery water heaters	1	2	Fireless cookers	1	2
Teapots	1	1	Flatirons, 7½ lb. or less	2	2
Hot-water kettles	1	1	Grills	2	1
Ovens	1	1	Heating pads	2	2
Reflector heaters	2	2	Hair dryers	2	1*

*One size in each style.

Ranges—Not more than six different ranges covering both styles and sizes to be made at any one factory, and none to be made at any factory that is not producing ranges at this date. Nickel plating and fancy ornamentation to be eliminated.

INDUSTRIAL APPLIANCES (OVER 660 WATTS)

	No. Styles	No. Sizes
Convection air heaters	3	7
Confectioners' appliances	2	2
Corset irons	1	1
Matrix dryers	1	1
Tailors' irons—12 lb. or over	2	4
Laundry irons — 7½ lb. to 10 lb.	1	2
Glue pots (no aluminum pots to be made)	1	3
Circulation water heaters	2	11
Immersion water heaters	1	8
Round-disk hot plates — open-coil type	1	4
Round-disk hot plates—solid top	1	3

Steam boilers—To be sold only where the electrical energy is generated from water power and there is a surplus of such energy available.

RESTAURANT EQUIPMENT

	No. Styles	No. Sizes		No. Styles	No. Sizes
Bake ovens	1	5	Toasters	2	2
Broilers	2	3	Hotel ranges	1	2
Grids	2	3			

In the appliances not discontinued the Conservation Division has cut out 691 different styles and sizes. For instance, in chafing dishes there were thirty-six styles and only three will be allowed; of electric teapots, twenty styles and one allowed; of toasters, ten styles and only two allowed. Manufacturers are to discontinue silver-plated and copper-finish appliances from the styles and sizes they will continue to make.

If You Like Liberty, Lend for It

RETAIL PRICE REGULATION BY WAR INDUSTRIES BOARD

Deeply Concerned Over the Whole Question, the Board Seeks Support of the Industries and Fair Deal for Public

B. M. Baruch, chairman of the War Industries Board, to make clear its position on retail price regulation, authorizes the following:

The board has treated matters of prices of raw materials, of manufactured products and of wholesale distribution. An effort is being made to adjust a fair scale of retail prices, based upon the cost of production, in coöperation with the various industries, which are attacking the problem under the guidance of the board in a spirit of coöperation and fairmindedness.

The board believes that this method will bring about beneficial results. No action ever has been or will be taken by this board affecting the interests of any industry except after consultation with representatives of that industry.

It should be said that the War Industries Board is deeply concerned over the whole question of retail prices and is intent upon gaining the support of the various industries.

MANUFACTURERS' PRIORITY FOR WASHING MACHINES

Regulation of Priorities Division of the War Industries Board Calls Attention to Fuel and Steel Needs

The Priorities Division of the War Industries Board, in Circular No. 12, signed by Edwin B. Parker and addressed to manufacturers of washing machines, sets forth the priority position of these manufacturers as follows:

The Priorities Division of the War Industries Board, in conference between your representatives and the undersigned with other representatives of the said board, has considered the claims of your industry for priorities in its fuel and steel requirements and has reached the conclusions following:

"*Fuel.*—The Priorities Division will receive and consider the application of any manufacturer in your industry for a place on the preference list for fuel, taking into consideration the fuel situation of such manufacturer and the nature of its product.

"Any manufacturer whose fuel requirements and whose output bear proper economical relationship to each other will be placed on the preference list for fuel; upon condition, however, that such manufacturer shall pledge its coöperation and shall observe its pledge and the rulings of the Priorities Board.

"*Steel.*—For the winning of the war steel is now the world's most precious metal. It is consumed, or used to some extent, every day by practically every civilized man in every civilized country and nowhere in such vast quantities per capita as in the United States. The present and constantly increasing steel requirements of this country and its allies for direct and indirect war needs, 100 per cent of which must under any and all circumstances be promptly supplied, are so enormous as well-nigh completely to absorb our constantly expanding producing capacity. The result is obvious. There will be comparatively little iron or steel left to distribute to those industries engaged in non-war work and to consumers for non-war uses. Every possible use of iron or steel or their products which can be deferred must be deferred until after the war. This duty is personal and cannot be avoided or delegated to your friends and neighbors. No consumption is so small as to be immaterial and no saving is insignificant.

ALL ORDERS DIVIDED INTO FIVE CLASSES

"Your careful attention is invited to Sections 1 to 11, inclusive, of Circular No. 4, issued by the Priorities Division of the War Industries Board under date of July 1, 1918, which sections describe five principal classes, with subdivisions thereof, into which all orders and work are divided and they also provide a basis for classifying all orders and work and of issuing priority certificates therefor.

"It will be noted that priority certificates are issued covering three classes, namely, Class AA, Class A and Class B. Class C comprises all orders and work not covered by priority certificates and not included in Class A or Class B automatic rating but which are embraced within the 'General Classification of Purposes Demanding Preference Treatment' appearing on page 17 of Circular No. 4, or which are placed by or are to be utilized in connection with an industry or plant appearing on Preference List No 1 prepared by the Priorities Board and appearing on pages 18 and 19 of Circular No. 4. In a majority of cases the application of the classification of purposes and of the preference list to orders received by manufacturers, jobbers or retailers can readily and accurately be made. Priority certificates are not issued for Class C orders and work. Class D comprises all orders and work not embraced in the higher classes and no certificates will be issued therefor. All orders for work or materials not covered by priority certificates or not taking automatic classification or not falling in Class C will fall with Class D.

"Preference List No. 1 referred to above is being revised from time to time by additions thereto and removals therefrom of individual plants and entire industries.

"In view of the nature of your industry, the amounts of iron and steel your manufacturers have now on hand, the economies in the consumption of iron and steel which will be brought about through the changes, eliminations and curtailments to which you have agreed, the industry requirements for its iron and steel for the remainder of 1918, not exceeding a certain agreed maximum, will be given a Class C priority rating; conditioned, however, that each manufacturer participating in the allotment shall pledge its coöperation and shall observe its pledge and the rulings of the Priorities Division.

"Such manufacturer's pledge of coöperation, as set out in this circular, shall cover its iron and steel already in its possession and its manufactured or partly manufactured washing machines in stock at the time its pledge is made as well as iron and steel hereafter acquired. In other words, the pledge will be construed as applying to all materials and all manufactured or partly manufactured washing machines and parts on hand when the pledge is given and to such as may afterward be acquired.

"The shortage of steel, present and prospective, is such that the Priorities Division does not undertake through this circular or through its priority certificates to guarantee to the industry or to any manufacturer its steel requirements. The success of the industry or of any particular manufacturer in obtaining its steel requirements will depend upon trade conditions and orders of higher priority.

"The pledge of coöperation to be given by the manufacturer will be in the form following:

Priorities Board, War Industries Board, Washington, D. C.:

The undersigned hereby pledges itself (1) to use only in the manufacture of washing machines or parts for washing machines the steel and iron and steel and iron parts suitable therefor which are now in its possession or which may hereafter come into its possession; (2) to devote the products of its manufacture as far as possible to essential uses only as that term has been or may be defined or applied from time to time by the Priorities Division of the War Industries Board; (3) to urge and procure so far as lies within its power all dealers in or users of its products to exercise all possible economy and conservation in such products by limiting sales and purchases, by intelligently repairing and by otherwise protecting and lengthening the life of such products; (4) to coöperate with the Conservation Division and the Electrical and Power Equipment Section of the War Industries Board; (5) not to furnish its products for resale to any leader unless such dealer shall give the undersigned a pledge in writing similar to this

pledge nor if such dealer shall fail or refuse to carry out the letter and spirit of its pledge, and (6) not to acquire or own during the remainder of the year 1918 more iron or steel (including iron and steel already owned by the undersigned) than shall be equal to three-fourths of five-twelfths of its actual consumption of iron and steel during the calendar year 1917, and not to hoard any iron or steel.

"Any manufacturer who has already made application for place on the preference list should send in its pledge of coöperation in the foregoing form and mention the fact that application has previously been forwarded.

"The pledge to be given such manufacturer by any person to whom it has delivered or shall deliver a washing machine for resale shall be addressed to such manufacturer in the following form:

To ———, City of ———, State of ———.

The undersigned hereby pledges itself (1) to devote the products of your manufacture as far as possible to essential use only as that term has been or may be defined or applied from time to time by the Priorities Division of the War Industries Board; (2) to urge and procure so far as lies within its power all dealers in or users of your products to exercise all possible economy and conservation in such products by limiting sales and purchases, by intelligently repairing and by otherwise protecting and lengthening the life of such products; (3) to coöperate with the Conservation Division and the Electrical and Power Equipment Section of the War Industries Board; (4) not to furnish your products for resale to any dealer who shall fail or refuse to coöperate with you in carrying out the letter and spirit of this pledge.

"Each manufacturer will promptly file with the secretary of the War Service Committee of the Washing Machine Industry a detailed statement in writing, verified by an affidavit, setting forth:

(1) The kinds and quantities of iron and steel in stock, including parts and manufactured or partly manufactured stocks, but excluding completed machines.

(2) The kinds and quantities of iron and steel and iron and steel products required in addition to existing stocks to equal three-fourths of five-twelfths of its actual consumption of iron and steel during the calendar year 1917.

(3) Upon receipt of such statements the War Service Committee of the industry will tentatively make and submit for the approval of the War Industries Board an allocation of such iron and steel requirements of each manufacturer as it may be entitled to receive out of the maximum fixed for the industry, allocating to each manufacturer its just proportion of such maximum based upon its per cent of the total consumption by the industry of iron and steel for the year 1917.

"When these allocations shall have been made and orders placed by each manufacturer, the Priorities Division will by certificates in writing addressed to such sources of supply give to such orders a Class C rating."

Beat the Germans Back—Buy Bonds

BALL-BEARING AND STEEL-BALL INDUSTRIES ON PRIORITY LIST

Manufacturers Placed on Preference List by War Industries Board with Rating of Class B-3 Conditioned Upon Pledges

The Priorities Division of the War Industries Board, n Circular No. 19, dated Sept. 3, 1918, has placed manufacturers of ball bearings and steel balls on the preference list with a rating of "Class B-3," conditioned upon their executing and filing pledges of co-operation with an observance of the rules of the Priorities Division.

GAS PIPING IN HOUSES WHICH HAVE ELECTRICITY

Installation of Gas Piping Where Electricity Is Available for Lighting Purposes Not Permitted Except Under Conditions

Regulations adopted by the building materials section of the War Industries Board at a meeting with representatives of other departments affected and covering mainly pipe and water mains provide, among various restrictions, that the installation of gas piping in houses will not be permitted where electricity is available for lighting purposes. This will not prohibit the installation of gas piping for heating and cooking purposes where the extreme extension of the distribution mains to the houses is less than 1000 ft. (304 m.).

Buy Bonds—It's War Service Work

CONTROL OF SURFACE-TYPE CONDENSER-TUBE INDUSTRY

War Industries Board in Order to Conserve Brass Will Regulate Distribution of Condensers Essential to Ships

The War Industries Board authorizes a statement regarding its arrangements for practically taking control of the surface-type condenser-tube industry:

Following a conference of the brass manufacturers with B. M. Baruch, chairman of the War Industries Board, and other members and officials of the board, and representatives of the navy and the Emergency Fleet Corporation, and a later conference of the board with the war service committee of the surface-type condenser industry, it was decided in order to conserve brass to regulate distribution of these condensers, which are essential to ships.

There are about forty-five manufacturers affected by the decision of the War Industries Board. They are being notified to take no further orders and enter into no new contracts for sale or to sell or deliver to any purchaser, government or civilian, except on a permit issued by the War Industries Board. To get such a permit the proposed purchaser must show his need to the satisfaction of the board, and this need will be considered in connection with the needs of the government in the conduct of the war.

The manufacturers will be permitted to fill, where possible, existing orders with non-ferrous condenser tubes on contracts for shipment prior to Jan. 1, 1919. On contracts after Jan. 1, 1919, the manufacturers are urged to put steel tubes on condensers for land use and are directed to send immediately estimates for steel that is required for this purpose.

The navy and the Emergency Fleet Corporation are exempt from these orders and regulations of the War Industries Board as to condensers for ship usage, but not as to condensers for land stations.

Some months ago the government took over control of and distribution of the turbine-engine industry because of the shortage in the supply and their essential need in the navy and Emergency Fleet war program. The non-ferrous condenser is an essential integral part of the turbine, and shortage in its production caused the navy and Emergency Fleet Corporation officials to appeal for government regulations of production and distribution.

The effect of the taking over by the government of the surface-type condenser tube industry was considered carefully by the brass manufacturers with Mr. Baruch, Everett Morse, chief of the non-ferrous tubing section, and Walter Robbins, chief of the electrical and power equipment section. It is the purpose of the government to stimulate production to meet war needs first and supply civilian needs if possible.

ATLANTA RATE RAISE IS UPHELD IN COURT

Petition of the City Authorities and So-Called Citizens' Committee for an Injunction Against Advance Is Denied

At the conclusion of the hearing in the Superior Court on Sept. 27 on the petition of the city of Atlanta and the so-called citizens' committee for an injunction to prevent the enforcement of the Railroad Commission's order authorizing rate increases, Judge G. A. Littlejohn handed down a ruling denying the restraining order.

In his order he held that the Railroad Commission had the right to authorize such increases and to change rates even where a contract existed. At the same time he instructed the Georgia Railway & Power Company to keep a strict audit of all increases in the event that his decision should be set aside in a higher court. It is expected that the city will appeal the case to the Supreme Court. The rates, as set out by the Railroad Commission as effective on Sept. 1, should go into effect on Sept. 27, the judge decided. The rate increase will average about 10 per cent. The company asked for 33 per cent.

Drive the Bayonet Home—Buy Bonds

PRIORITY FOR ATLANTA POWER DISTRIBUTION

"At This Time Personal Desires on the Part of Manufacturers Must Be Subservient to the General Good"

The Priorities Committee of the War Industries Board issued an order recently directing the priority to be observed by the Georgia Railway & Power Company, Atlanta, in the distribution of energy until increase in the water supply should increase the amount available. Through Charles K. Foster, vice-chairman, the committee wrote to the company in part as follows:

The figures represented show that after taking care of the municipal and public lighting, together with the power necessary to operate the street railways and waterworks pumps, you have remaining approximately 152,000 kw.-hr. per day. It is estimated that this is not sufficient to serve all the concerns that have government contracts, but that it is approximately enough power to serve the concerns that are working 100 per cent on war work by elimination of current to all other users.

In view of this condition, we urge you to proceed, while this condition exists, along the following lines:

1. That the Rome Railway & Light Company be instructed to start immediately its steam plant in operation and arrangements will be made with the Fuel Administrator to furnish it with coal for such operation. It is understood that if this is done the energy which you have been furnishing this company can be given to the Anchor Duck Mills for their consumption on government work.

2. It is suggested that you immediately get in touch with the Fuel Administrator and jointly with him for this committee determine the concerns working to approximately 100 per cent capacity on government work and furnish power to such concerns in accordance with the suggestions above. (The above suggestion, of course, means to the best of your ability.)

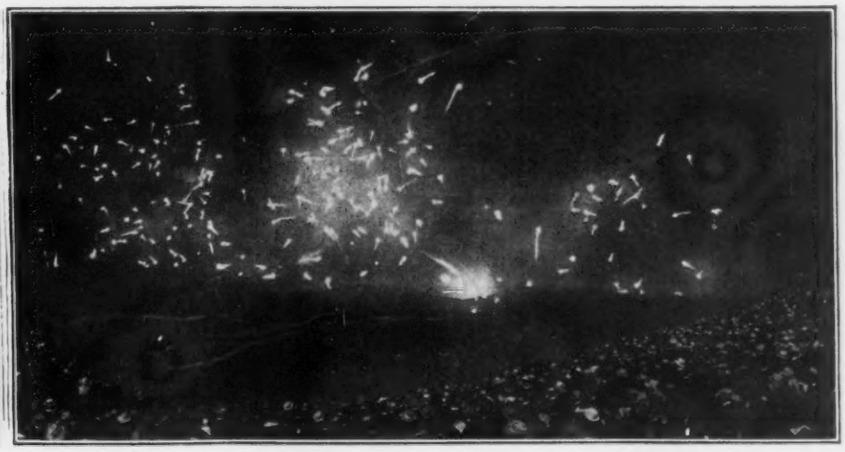
3. Where an individual steam plant can be operated at this time to advantage in the generating of power the Coal Administrator, to the best of his ability, should supply such concern having a steam plant with fuel during this crisis.

4. In order that a central control, which is necessary at this time, can be had of the situation, you are asked respectfully to refer all requests for power from whatever branch of the government they come to the Priorities Committee at Washington and not operate under any other instructions.

5. Relative to the injunction which has been granted the Bibb Manufacturing Company regarding its supply of power, we are of the opinion that if same operates to the detriment of the whole situation steps can be taken either to cancel their government contracts or to defer their production until such time as more power is available.

We might add that at this time all personal desires on the part of the manufacturers must be subservient to the general good, and we feel assured that when the matter is presented to the different concerns in this light we may expect their full-hearted co-operation to tide over this emergency.

Government War Exposition Draws Two Million Spectators



Fallen enemy airplanes, demolished anti-aircraft guns and heavier cannon, shells, Liberty motors, war trophies and three miles of actual trenches in which a sham battle was staged—all these were features of the United States Government War Exposition at Chicago, Sept. 1 to 15. In that time, 1,995,602 people, an average of 139,685 a day, visited the great war show. Samuel Insull, general chairman of the United States Government War Exposition, announced that the income from the show was over $500,000, which is sufficient to meet all expenses and leave the government a surplus. "Over the Top," as the battle was called, was the attraction which held and thrilled the crowds.

CHICAGO METHODS OF CONSERVING COAL SUPPLY

Conservation Bureau of the United States Fuel Administration Reports Results in Substitution of Electrical Energy and Water Power

Large coal saving, to supplement the war speeding up of production, is reported by the Conservation Bureau of the United States Fuel Administration. The bureau's administrative engineer for Illinois, Joseph Harrington, reports that in Chicago the power and light committee has induced the Chicago, Western & Indiana Railroad to close its pumping plant at Forty-eighth Street and the railroad tracks, substituting electric power. This change will reduce coal consumption at this plant 800 tons within the next two months.

The Sanitary District has been induced to enter into an agreement with the Commonwealth Edison Company by which through the substitution of water power an average of 150 tons of coal a day will be saved.

The city of Chicago will, by using the Sanitary District water power at its largest pumping station, be able to save 18,000 tons of coal a year.

Thus, in only three specific instances within the city of Chicago, the new conservation methods, so necessary at the present crisis, account for a coal saving of 73,550 tons annually.

Drive the Boche Back—Buy Bonds

FUEL ADMINISTRATION TO FIX HIGHER COAL-MINE POWER RATE

Too Low Rate for Electrical Energy to Operate Mines in Virginia Field Prevented Increased Development

A sidelight on the part the Fuel Administration is playing in helping the nation's great coal-producing machine accomplish its huge task with little friction and noise was revealed by an official statement of the settlement of a very difficult power situation in the Virginia field. Power companies furnishing electrical energy to run the Virginia mines were under contract at so low a price as to prevent increased development. Increased power facilities, however, became a necessity. The operators and the power companies met with the Fuel Administration. The following resolution was passed unanimously by all present:

Resolved, that the committees from Harlan County, Kentucky, Bell County, Kentucky, and southwestern Virginia, representing the coal companies which are consumers of power from the above-mentioned fields, agree to submit the question of fixing the amount of increase necessary to provide the power companies the funds to serve the above consumers with satisfactory power to the price-fixing and engineers' committees of the United States Fuel Administration, and we hereby agree to abide by the recommendations of the said committees, and will so recommend to the respective coal operators of our fields.

Bomb the Enemy—Buy Liberty Bonds

FUEL ADMINISTRATION PLAN IS SAVING COAL

Consolidation of Power Plants, Substitution of Hydro-electric Energy and Closing of Private Generating Stations Give Results

The United States Fuel Administration reports that a large saving of coal is indicated in power plants as a result of the campaign for economy. A bulletin on this subject says in part:

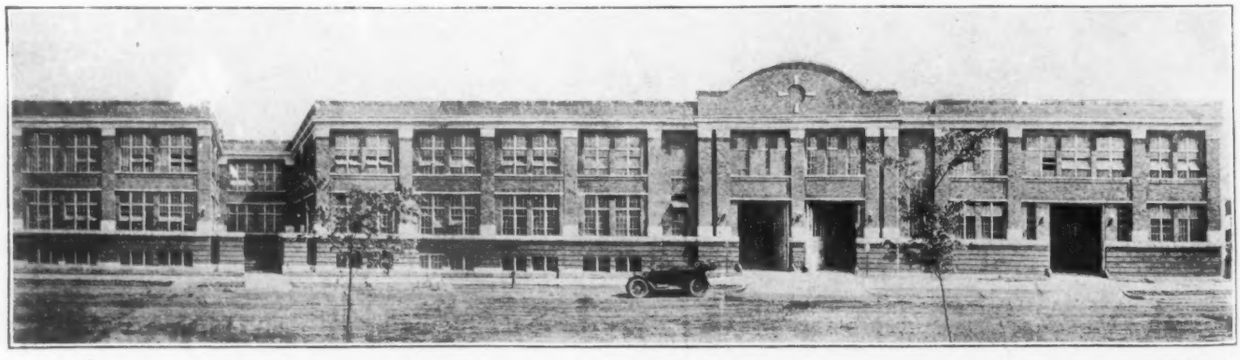
Figures are now coming in showing very substantial savings of coal from the power changes already made. Consolidation of power plants at Richmond, Va.; Ludlow, Mass.; Wooster, Ohio; Charleston, W. Va.; Kirkwood, Mo., and at Clinton, Ind., reported to the Fuel Administration, will mean a yearly saving of 35,000 tons of coal.

At Mammoth Springs, Mo., the Mammoth Springs Light & Power Company has effected new power contracts whereby excess water power is replacing power generated from coal. The saving will approximate 2000 tons of coal annually.

In Keokuk, Iowa, the application of water power for power needs has replaced the supply formerly produced by steam in St. Louis, Mo. The saving here is about 110,000 tons each year.

Power from more efficient stations having been substituted, eight private electric generating plants have closed down in Missouri, forty plants in New York City, twenty-five plants in Chicago.

Service Station Costing $1,500,000 Completed at Minneapolis



Here is evidence of evolution from the day when somebody's barn was good enough to serve as storehouse, meter department headquarters and in a variety of similar ways for the central-station company.

This huge structure, representing an investment of more than $1,500,000, is the service building of the Minneapolis General Electric Company. It houses the company's vehicles, its stocks of material, its meter department and the office force for handling all of these necessary adjuncts to electric service.

Associations and Societies

The Directory of Electrical Associations, which is regularly printed in the first issue of each month, appears on page 679 of this number.

Electrical Club of Detroit.—At the last meeting of the Electrical Club of Detroit, Sept. 20, C. T. Beck was elected president and George B. Clover secretary.

Electrical League of Cleveland.—At the regular Thursday meeting of the Electrical League of Cleveland held Sept. 26 Dr. J. G. Clutterbuck addressed the league on the subject "Why Germany Must Be Destroyed."

Institute of Radio Engineers.—Prof. Edward F. Northrup of Princeton University will address the next meeting of the Institute of Radio Engineers, Oct. 9, Engineering Societies Building, New York, at 8:15 p.m. The subject of his paper is "Special Heating Effects of Radio Frequency Currents."

San Francisco Electrical Development League.—At the Sept. 19 meeting Garnett Young, of the Garnett Young Company, was elected president. The speaker of the day was G. R. Geary of Yokohama, who has been Japanese representative of the General Electric Company for a period of about fifteen years.

A. I. E. E., Schenectady Section.—The 204th meeting of the Schenectady Section, A. I. E. E., was held at Edison Club Hall, Friday, Oct. 4. Representative George R. Lunn, a member of the House military affairs committee, spoke on "A Democracy at War," with special reference to the part which engineers are taking.

A. I. E. E., Toronto Section.—The Toronto Section of the American Institute of Electrical Engineers opened its sixteenth year on Sept. 20 with an address by Paul M. Lincoln on the subject of "Development of Electric Power Transmission." Mr. Lincoln's paper was particularly interesting to the audience in view of the possibility that the Hydroelectric Power Commission will transmit the energy to be developed at Queenston, Ontario, at 200,000 volts.

San Francisco Electrical Development League.—League meetings were resumed after the summer interval on Sept. 4. Albert E. Schwabacher, Fuel Administrator for California, was the main speaker of the day, addressing the members on the subject of "The How and Why of Fuel Conservation." H. G. Butler, Power Director for California, spoke on the subject of power conservation. A. H. Buckland, formerly of the famous "Princess Pat" regiment, addressed the meeting on Sept. 11 on "Thrilling Experiences at the Front."

British Columbia Association of Electrical Contractors and Dealers.—On Sept. 13 and 14 this association held its annual meeting at Victoria. There was a "get together" luncheon at which E. C. Hayward of Victoria was toastmaster. E. Brettell of Vancouver was elected president of the association. A long discussion of affiliation with the national association resulted in the decision to unite with this body on Oct. 1. R. F. Hayward made a forcible address on the progress and possibilities of electricity during and after the war. A feature of the attendance was the large representation from wholesale houses.

California Association of Electrical Contractors and Dealers.—The regular monthly meeting of the California Association of Contractors and Dealers was held at the Clark Hotel, Stockton, on Aug. 30. In the absence of President Reid, T. J. Bennett occupied the chair. A progress report of the work of the committee on the segregation of government electrical work was accepted and the committee was instructed to continue its efforts. The ethics committee submitted a code governing the conduct of members in all professional capacities. This was adopted. The next meeting will be on Oct. 12 at Modesto.

Jovian Order.—Two important questions stand out prominently before the Jovian Convention which will be held Oct. 24-26 at Dallas, Tex.—first, that of financing the organization; second, that of directing the greater part of the activities during the coming year in war work. The financial plan, according to those who have had it under consideration, if adopted, will to a great extent remove the burden of financing the order from the rank and file of membership by the reduction of the annual dues, while at the same time providing a source of revenue that will fully offset the depletion of income caused by the call of members for war service. Regarding war work several plans are under advisement, the prime object of all being to turn the forces of the organization to government uses.

National Association of Electrical Contractors and Dealers.—Final arrangements have been made for the meeting of the national executive committee of the National Association of Electrical Contractors and Dealers in Toronto on Oct. 14, 15 and 16. The meeting will be held at the King Edward Hotel and will be open to all branches of the industry. There will be a banquet on Tuesday evening at which the chair will be occupied by Senator Frederic Nicholls, president of the Canadian General Electric Company, Ltd. President James R. Strong will speak on organization and W. L. Goodwin on the Goodwin plan. The British government will have a trade commissioner present at this meeting, keeping in touch with the move that is attracting attention in other than electrical circles.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Discontinuance of Heating Service.—Acting on a petition of the Illinois Northern Utilities Company relative to the discontinuance of heating service at Belvidere, the Illinois Public Utilities Commission held that it would require a utility to continue rendering heating service, at a rate which would pay operating expenses, during the approaching season, where the evidence showed that the plant had neared the end of its useful life and the system had been operated at a loss, but conditions were such that to permit the company to discontinue service at once might leave many consumers without means of heating their premises.

Rate Relief Will Help Food Production.—The California Railroad Commission has authorized the Mount Whitney Power & Electric Company to make a temporary surcharge of 10 per cent on all bills for electric service. The new rates are effective on all readings for metered service after Sept. 15 and for flat-rate service after Sept. 1. The company must make a report each month to the commission of the results of its operation during the past month. The electric service supplied by the company is largely used for pumping water for irrigation, and the continuance and extension of this service are absolutely essential to the production of food so necessary at this time. The evidence shows that the company expended during 1917 over $300,000 in the extension and enlargement of its system to serve the territory more adequately, and that practically all of this was for extensions to serve necessary agricultural plants. The expenditures required in 1918 will equal or exceed this amount. More than 6000 hp. more of power motors, mostly for pumping water, will operate in 1918 than last year on the company's system. The addition of the 10 per cent surcharge would in six months increase the net return upon the investment to 5.8 per cent, and if effective for a full year, would result in an estimated net return of 6.61 per cent upon the total capital invested. "Considering the rate of interest which public utilities are required to pay to obtain money for extensions and betterments at this time," says the decision, "it is very apparent that it would not only be unfair to the utility but detrimental to the development of territory served by the company not to grant the relief requested, for it is obvious that the food production of the district would be curtailed and the prosperity of the territory as a whole decreased."

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Powerful Radio Station at Annapolis.—The new naval radio station at Annapolis, Md., the most powerful in America, is now in operation. The Navy Department announced that the first messages sent were from Secretary Daniels to the First Lord of the British Admiralty, the French Minister of Marine and the Italian Minister of Marine. The station, which has an operating radius of 4000 miles, was completed in ten months and cost $1,500,000.

Milwaukee Gets Money for Street Lighting.—The Capital Issues Committee has granted the city of Milwaukee permission to sell $200,000 of securities to finance a portion of the street lighting which has been under way for some years. Before acting on this case the Capital Issues Committee received reports from two independent engineers and heard the arguments of the city's engineer, Francis A. Vaughn. As the result of these reports it appeared necessary to continue with that portion of the street lighting which will serve the industrial districts.

Eastern Power & Light Difficulties.—A note and bondholders' protective committee, also a stockholders' protective committee, have been formed by security holders of the Eastern Power & Light Corporation. President J. B. Taylor, New York, in a letter to security holders, gave notice that the $2,159,000 principal of collateral trust notes, due on Sept. 1, 1918, could not be paid at maturity, but that interest would be paid. He said in part: "The company and all of its subsidiaries could have continued to meet their charges and maturities in normal times, and the change in conditions is due directly to the war. In normal times they have been and would be able to meet all fixed charges and dividends, and with increasing revenues from enlarged power plants and systems to accumulate a surplus which would have facilitated under normal financial conditions the refunding of obligations of subsidiaries as they matured, through sale of securities. When the officers of the company asked its bondholders for the extension of its bonds for six months to Sept. 1, 1918, they expressed the hope that relief might be obtained from the War Finance Corporation. The directors, however, under the interpretation of the modified act by counsel for the government, have been precluded from granting relief in this and similar cases."

Praise for Patriotic Women in Central-Station Work.—The Sept. 7 issue of the *Women's Press* contains an article on the patriotic work of several hundred women employees of the Com monwealth Edison Company, Chicago. The article says in part: "The number of women employees has been greatly increased by reason of the fact that about 1200 of the male em ployees have entered the government service. There are now about 700 girls and women employed by the company. They have exhibited unfaltering patriotism, and the list of their accomplishments in war work shows achievements of genuine usefulness and much diversity. Nor has social recreation for the soldiers and sailors been neglected, Mrs. Samuel Insull's Saturday night dances in the Edison Building having become an established institution during the first half of this year."

Electric Vehicles in Spain.—A. Jackson Marshall, secretary Electric Vehicle Section, National Electric Light Association, reports that the demand for American-built electric vehicles by European countries continues to exceed the supply and available shipping facilities. Spain is the latest country to evidence a desire to utilize on a large scale electric vehicle transportation, not only for immediate use to help out in emergency conditions, but more particularly to form the basis of a systematic mobile transportation development to meet the conditions which will prevail with the return of peace. To this end several engineers, representing important Spanish interests, have been in the United States making careful investigations of electric vehicle developments here preliminary to effecting arrangements for the importation and manufacture of electric vehicles and parts.

United States Navy Steam Engineering School.—The United States Navy Department has perfected plans for the enrollment and training of considerable numbers of engineering officers. A school for this purpose, the United States Navy Steam Engineering School, has been established by the department at Hoboken, N. J. The school is open to men between the ages of twenty-one and forty, who meet the physical requirements of the navy, are of thorough ability and officer-like character and have completed the mechanical or electrical engineering course at certain recognized technical schools, or who possess an education and experience adjudged to be an equivalent thereof. The course consists of five months of training. The aim of the United States Navy Steam Engineering School is not simply to produce engineers but to produce naval engineering officers in the true sense of the word. Upon graduation the student is commissioned as an ensign in the United States Naval Reserve, with a salary of $1,700 per year, and is detailed for engineering duties on navy transports and cargo ships.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Regulation of Rates.—Where a power company contracted to furnish electricity to platted lands at a certain rate in return for certain easements, and lots were sold subject to such easements, the power company, while claiming the benefit of the property rights, easements and franchise so granted, cannot collect greater rates, although approved by Public Service Commission, according to the Supreme Court of New York in Village of Long Beach versus Long Beach Power Company (171 N. Y. S. 824). Where a power company contracted to furnish electricity to platted lands at a certain rate in return for certain easements, subject to which lots were sold, lot owners need not apply to Public Service Commission for redress where power company attempts to charge more than contract rate under a schedule approved by the Public Service Commission.

Competing Utility Allowed to Enter Town Under Certificate of Necessity and Convenience.—A contract of an electric company giving a city 100 kw.-hr. free monthly, worth about $40 per annum, will not be held to be a discrimination in favor of the city, where the value of electricity furnished the city for other lamps exceeded $2,000 per annum, the Supreme Court of Missouri held in Electric Company of Missouri versus Kinsor (204 S. W. 897). If an item in a franchise by a city to an electric company is invalid because discriminatory but the city and the light company are satisfied with the remainder of the franchise, a competing company cannot complain that the whole franchise is invalid. The statute empowers the Public Service Commission to issue a certificate of convenience and necessity to an electric light company or to refuse it, but does not empower it to adjudicate the question of the validity of franchises. Where one of two electric light companies can furnish electricity and make a reasonable profit at a certain rate, the other company has no right to any higher rates even though it cannot furnish it at the lower rate without a loss. In fixing rates for electricity protection of the public is the prime object, protection to the utility being incidental, and whether there should be regulated monopoly or competition depends on the particular facts in each case. The commission was held warranted in issuing a certificate of necessity and convenience to an electric light company, although another company was already furnishing electricity in the locality.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

D. M. Petty, president-elect of the Association of Iron and Steel Electrical Engineers, is superintendent of the electrical department of the Bethlehem Steel Company, South Bethlehem, Pa. Mr. Petty was born on March 2, 1885, at Archdale, N. C. He was graduated

D. M. PETTY

from Guilford College in 1907 with the degree of B. S. and two years later from Lehigh University with the degree of E. E. Since then he has been with the Bethlehem Steel Company and in 1913 was made superintendent of the electrical department. He has wide association connections and is president of the University Club of Bethlehem.

S. B. Burrows, general lighting representative of the Public Service Electric Company, Newark, N. J., has gone to France with the Y. M. C. A. as an athletic director. Mr. Burrows started with the Public Service company in 1910 as electric sign specialist and shortly afterward was promoted to be general lighting representative. He was chairman of the store-lighting committee of the Commercial Section, National Electric Light Association, for the past four years.

F. W. Hausmann, connected with the Air Nitrates Corporation on the construction work of United States Nitrate Plant No. 2, as progress engineer for the equipment department, has been promoted to be head of the local planning division at Muscle Shoals. Previous to coming to Muscle Shoals he was for two years with the Aluminum Company of America as process control and efficiency engineer. Since graduation from the Georgia School of Technology in electrical engineering in 1910 he has been connected with Stone & Webster, the General Electric Company and the Henry L. Doherty Company. On the Panama Canal he made a study of the shops and electrical layout. As soon as the plant construction related to the war program is completed Mr. Hausmann intends to enter the field of invention in connection with the development of special equipment for industrial plants.

M. T. Maguire, Rosemont, Pa., formerly connected with the Bethlehem Steel Company, South Bethlehem, in charge of the power plant of the company, has resigned to become associated with the Symington Company, Chicago.

E. H. Jacobs, until recently chief engineer of the Electrical Engineers' Equipment Company, Chicago, has been appointed general manager, succeeding Frank H. Getts, who died recently. Mr. Jacobs was connected with the General Electric Company for eighteen years. He was made chief engineer of the Electrical Engineers' Equipment Company in the fall of 1916.

William F. Ham, who has been acting as president of the Washington (D. C.) Railway & Electric Company since the resignation of C. P. King in March of this year, was elected president of the company on Sept. 12. He first became connected with the Washington property in 1899 as controller. Later he became treasurer and in 1911 was elected first vice-president and a director of the company.

Obituary

Frank S. Mitchell, general superintendent of steam plants of the Southern Power Company, Charlotte, N. C., died on Sept. 8, from strangulation.

Lieut.-Colonel Morris N. Leibmann, vice-president of the Foote-Pierson Company, New York City, engineers and electrical manufacturers, was killed in France on Aug. 8 while leading his men in action.

Frank A. Harmon, secretary and manager of the Eastern Oregon Light & Power Company, Baker, Ore., died at his home on Sept. 12, aged sixty years. Prior to his going to Baker in 1908 Mr. Harrison was general manager of the Fremont Power Company, Sumpter, Ore., with which company he was associated for five years.

Joseph Parkin, electrical engineer, and for several years manager of the Puget Sound Traction, Light & Power Company's interests in Everett, Wash., died in Seattle on Sept. 15. Up to a year ago Mr. Parkin was one of the receivers of the old Seattle, Renton & Southern Railway Company, and prior to that period he had charge of the electrical property of the government at Fort Worden. Mr. Parkin was fifty-four years of age and had lived in Washington for thirty years.

Lieut. Henry Stone Bryant, aviation service, U. S. A., and previously assistant superintendent of the appliance department of the Boston Edison company, died of influenza Sept. 24 at his home in Cambridge, Mass. Lieut. Bryant was thirty years of age and was a graduate of Harvard College, class of 1910. He studied aviation at Kelly Field, Tex., and later became disbursing aëronautical officer at Boston. He was popular among the employees of the Edison company and was a member of the Harvard Club.

Samuel A. Freshney, district manager for Grand Rapids, Mich., of the Consumers' Power Company, died at his home on Sept. 16, after an illness of only a few hours, at the age of fifty-one years. Mr. Freshney, who had been engaged in the electrical industry for the last thirty-four years and was one of its pioneers in the Middle West, was born in London, England, in 1867. When still a boy he came to this country with his parents and received his early education in the schools of Cleveland, Ohio. He began his electrical career in 1884 with the Brush Electric Company of Cleveland, where he stayed for seven years. From then until 1900 he was manager of the Muskegon (Mich.) Electric Light & Power Company, when he became sales representative for the Fort Wayne (Ind.) Electric Works. He continued this work for two years, when he returned to Muskegon as general manager of the Muskegon Traction & Lighting Company. He was secretary and general manager of the Grand Rapids (Mich.) Board of Public Works from 1905 to 1912, and at the close of his term of office was employed for a few months by the Electric Bond & Share Company. In the fall of 1912 he became general manager of the Grand Rapids-Muskegon Power Company, and

S. A. FRESHNEY

on the merger with the Consumers' Power Company he retained the managership of the Grand Rapids district. Mr. Freshney took considerable interest in national association activities and in 1915 was elected president of the Michigan Section, N. E. L. A.

TRADE & MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies— Notes on Industrial Activities and Business Methods

WAR SUPPLY BUREAUS TO TAKE ADVANTAGE OF CASH DISCOUNT

Contractors Will Be Asked to State in Proposals Amount They Will Allow the Government to Insure Prompt Payment

Electrical supply jobbers and manufacturers have frequently called attention to the length of time their money has been tied up in government orders. This has caused considerable inconvenience at times. To a large extent this condition will probably be ameliorated by the recent action of the War Department authorizing all supply bureaus of the department, whenever possible, to take advantage of cash discounts for the prompt payment of bills. Instructions to do so have just been issued by the General Staff.

Contractors who have followed the custom of granting such cash discounts to the public will be required to state in their proposals the amounts they will tender the government for the prompt payment of their bills. In those cases where it has not been the custom to give fixed cash discounts for prompt payments the government will request the contractors to state how much they will give for prompt payment. These discounts will be taken into consideration by contracting officers when making awards. Arrangements have been made to allow the government discounts on "materials and supplies on which a fixed or maximum price has been set" whenever these discounts have not been included in the differential between prices made for the government and for the public.

That the government may be sure of such discounts in the future, it is provided in the instructions that all materials and supplies shall, in so far as possible, be inspected and accepted by the government at the point of manufacture or origin. The inspecting officer is ordered to see that the proper vouchers are sent through promptly to the contracting officer, with the government bill of lading attached, so that the bill may be paid within the specified time during which discounts will be allowed.

Money Builds Tanks—Buy Bonds

INCREASE IN THE PRICE OF "MAZDA B" LAMPS

New Contract Forms Provide for an Advance of Not More than 15 per Cent During the Coming Year

Effective Oct. 1, large "Mazda" lamps (excepting gas-filled lamps) were increased in price roughly 15 per cent. The lamps for standard lighting service, 10-watt to 50-watt sizes, increased from 30 to 35 cents for clear bulbs and 33 to 38 cents for frosted; the 60-watt size was 35 cents clear and 39 cents frosted and is now 40 and 45 cents for clear and frosted respectively. The 100-watt size, which was listed at 70 cents clear and 77 cents frosted, is now listed at 85 cents clear and 92 cents frosted.

This is the second increase in the history of "Mazda" incandescent lamps, the first, of roughly 10 per cent, occurring Jan. 1 of this year.

According to the contract forms of last November, the manufacturers reserved the privilege to increase the price of lamps during the life of contract (one year) by not more than 10 per cent on any one lamp to consumers who hold these contracts. The new contract forms, which are just out, are similar to these others except that a provision is made that the price during the life of the contract shall not advance more than 15 per cent over the prices in effect at the time the contract started. The new list prices on "Mazda B" or vacuum types follow:

Volts	Watts	Bulb	List Price Clear	List Price Frosted
		SCHEDULE 1		
110-125	10-15	S-17	$0.35	$0.38
110-125	25-40-50	S-19	0.35	0.38
110-125	60	S-21	0.40	0.45
110-125	100	S-30	0.85	0.92
		SCHEDULE 2		
220-250	25-50	S-19	0.40	0.43
220-250	100	S-30	1.00	1.07
220-250	150	S-35	1.50	1.60
220-250	250	S-40	2.50	2.65
		SCHEDULE 3		
110-125	15-25-40	G-25	0.55	0.60
110-125	60	G-30	0.75	0.82
110-125	100	G-35	1.05	1.15
220-250	25-50	G-25	0.65	0.70
110-125	25	T-10	0.60	0.65
110-125	25-40	T-8	1.20	1.30
		SCHEDULE 4		
11-12½	2½-5	S-14	0.32	0.35
55-65	5	S-14	0.35	0.38
110-125	10	S-14	0.35	0.38
		SCHEDULE 5		
525-650	23-36	S-19	0.35	0.38
525-650	56	S-21	0.40	0.45
525-650	94	S-24½	0.85	0.92
		SCHEDULE 7		
30-34, 60-65	10-15-20-25	S-17	0.35	0.38
30-34, 60-65	50	S-19	0.35	0.38
30-34, 60-65	85-125-175-250	G-18½	0.50	0.53
30-34, 60-65	500	G-30	0.75	0.82
		SCHEDULE 8		
28-32	5	S-14	0.35	0.38
28-32	10-20	S-17	0.35	0.38
28-32	40	S-19	0.35	0.38

Note.—On bulb types the following notation is used: S = straight sides, G = round, and T = tubular.

Schedule 1 is for standard lighting, 110 volts to 125 volts; schedule 2, the same for 220 volts to 250 volts; schedule 3 for ornamental lighting, schedule 4 for sign lighting, schedule 5 for electric street railways, schedule 7 for train lighting, schedule 8 for use with country home-lighting outfits. Schedules 6, 9 and 10 pertain only to gas-filled lamps, on which the price has not been changed.

Bonds Buy Bayonets for Liberty

CHARGE VIOLATIONS OF "HELP WANTED" RULE

United States Employment Service Cites Infringements of "Special Inducement" and "Wages" Clauses of Regulations

Violations of the rule of the United States Employment Service relative to "help wanted" advertisements have come to the attention of the authorities, and in such cases the offenders have been notified. The most frequent violation is the offering in the advertisement of special inducements.

Inasmuch as a large number of electrical manufacturing concerns have been pioneers in employer welfare work, much of which would probably come under the head of "special inducements," the citation of a few of the infringing advertisements and the rule, as given by the United States Employment Service for the State of New York, are especially interesting.

One firm advertised for machinists as follows: "Highest prevailing wages; plenty of overtime; 10 per cent bonus." Another corporation advertised for boys as follows: "Good salary; time and a half for overtime; cafeteria with best food at cost price." Both of these advertisements were held to infringe the "special inducement" clause of the rule. Another common infringement is the statement of wages, as, for instance: "Boy, sixteen years old, at $8 salary." This is a violation of the rule.

The rule of the United States Employment Service which has been applied in the above instances reads as follows:

"Advertising for all grades of workers above laborers is permitted provided that such advertising shall not contain mention of wages or hours or special inducements. The wording of the advertisement for the more skilled workers shall be confined to a statement of the number of workers wanted, the different grades and occupations and the place where applicants shall apply."

Let Dollars Fight the Kaiser

METAL MARKET SITUATION

Campaign Started to Bring About the Conservation of Tin as a War Necessity

Generally speaking, the various metal markets have been quiet this week. There is little speculation regarding the coming meeting relative to the fixing of the price of copper after Nov. 1. A campaign was started this week for the conservation of tin as a prime war essential. The war requirements in aluminum have made it necessary to scrutinize more closely than heretofore stocks carried, production, consumption and character of the consumption. To do this properly the trade has been requested to provide definite specific information regarding its operations.

The Department of the Interior, Bureau of Mines, has issued in pamphlet form the rules and regulations under the act of Oct. 6, 1917, as amended by the act of July 1, 1918, limiting the sale, possession and use of platinum, iridium and palladium and compounds thereof. All communications regarding applications, licenses, inventories or other matters pertaining to these regulations should be addressed to Platinum Section, War Industries Board, Washington, D. C.

NEW YORK METAL MARKET PRICES

	Sept. 24	Oct. 1
Copper:	£ s d	£ s d
London, standard spot	122 0 0	122 0 0
	Cents per Pound	Cents per Pound
Prime Lake	Govt. price 26.00	Govt. price 26.00
Electrolytic	Govt. price 26.00	Govt. price 26.00
Casting	Govt. price 26.00	Govt. price 26.00
Wire base	29.25	29.25
Lead, trust price	8.05	8.05
Antimony	13.87½	14.00 to 14.12½
Nickel, ingot	40.00	40.00
Sheet zinc, f.o.b. smelter	15.00	15.00
Spelter, spot	9.65	9.40
Tin, Chinese *	No quotations	No quotations
Aluminum, 98 to 99 per cent	Govt. price †33.10	Govt. price †33.10

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	23.50 to 24.50	23.50 to 24.50
Brass, heavy	14.00 to 15.00	14.00 to 14.25
Brass, light	11.50 to 12.25	11.50 to 12.00
Lead, heavy	7.50 to 7.75	7.50 to 8.00
Zinc, old scrap	6.50 to 6.75	6.50 to 6.75

*No Straits offering. † In 50-ton lots or more; carload, 33.10 cents per lb.; 1-ton to 14-ton lots, 33.20 cents per lb.

THE WEEK
IN TRADE

SO FAR as can be learned, the volume of business in electrical supplies and materials is continuing as large as ever. Reports still come in showing the extent to which the trade is working on government or closely allied orders. There is now very little left of the ordinary commercial trade. The War Industries Board's recent ruling has had a noticeable effect in curtailing new construction, building permits having fallen off considerably.

Price changes are still taking place, the most important this week being in incandescent lamps. The other changes are many of them the result of labor conditions and of the high price of cotton. Deliveries do not appear to be much better if any.

Among the new projects is that of the Hydro-Electric Power Commission of Ontario for the initial hydraulic equipment of the Chippawa-Queenston power development. Bids were called for until Oct. 1 on four 52,500-hp. turbines, a total of 210,000 turbine horsepower.

NEW YORK

So far as possible every one is working on the Liberty loan drive, in which the local electrical trade is taking an important part.

A few price increases were made this week, the most important being that on incandescent lamps. The greatest secrecy accompanied this increase, and very few people knew of it until it had actually taken effect on Tuesday of this week.

Building is still falling off, but there still exists a spirit of optimism and expectancy that conditions will be such in the spring that building can start up again in a limited way. The military operations of the past week have served to heighten this belief.

METERS.—Watt-hour meters have advanced in price 10 per cent since Sept. 10.

CROSS-ARMS AND PINS.—The Emergency Fleet Corporation has commandeered all plants manufacturing locust pins for cross-arms, and the price per 1000 for carload lots has doubled. The production of fir and yellow pine cross-arms has been considerably reduced owing to government airplane and shipping requirements. All deliveries from factories are very slow owing to the labor and railroad situation.

LAMPS.—Prices on "Mazda B" incandescent lamps advanced on Oct. 1 roughly 15 per cent. Type C lamps were not advanced. Manufacturers are still busy signing up local agencies among the retail trades. Indications are that the coming year will be the best lamp year ever seen in the East.

WIRE.—Weatherproof advanced this week anywhere from 2 to 3½ cents a pound, due largely to labor and excessive cotton costs. Wire base is still ranging at from 30 to 37 cents. Considering the discounts, however, wire base may be said to be 34 cents. One jobber reports an advance in insulated wire of 25 to 30 per cent.

INSULATION.—Varnished cambric advanced in price about 10 per cent on Sept. 15. Further price movements will be governed chiefly by the price of cotton.

CONDUIT.—There has been no change this week except perhaps that the market is still tighter.

APPLIANCES.—Following the order of the times, conservation, the largest dealers are advising their customers

to have old appliances repaired. One large central station has found this work to have increased as much as ten times since the war broke out. The delivery of raw materials is exceedingly slow, but the trade hopes that by Oct. 15 this situation will be much improved. No advance in prices is contemplated now. Great difficulty is experienced in obtaining stocks of appliances and of repair parts. Manufacturers are urging customers to curtail purchases wherever possible.

CHICAGO

Indications are that increasing demand for electrical supplies should be expected over and above the usual increase in fall business. The following are specific instances setting forth some of the activities which should create this demand: The Consumers' Packing Company of Chicago will build a new packing plant, to cost $1,250,000, in the stock yards district. The plant will comprise a power house, abattoir, cold-storage building, machine house and several other buildings. It is stated that the company has secured the approval of the Agricultural Department of the government and that the work of construction will be pushed to as speedy a completion as possible. Contracts for 374 houses accommodating 400 families, together with all necessary public utility connections, have been awarded to the Central Engineering Company of Davenport, Iowa. Other similar government contracts were awarded to the Henry W. Herst Company of Rock Island for 321 houses at Moline, East Moline and Rock Island. Contracts were let on a fixed-fee basis. The Illinois Manufacturers' Association now has representatives in Washington seeking a fifty-million-dollar aeroplane contract which it is expected to apportion among a number of wood-working and metal-working plants in the Chicago district. To assemble the parts produced by these plants an immense assembly station is planned, the site selected being one which will give facilities for testing both aëroplanes and hydro-aëroplanes.

Government activities continue to be the center of interest in the trade at Chicago. Chicago jobbers are unanimous in approving the action of the government in limiting the number of styles and types of devices manufactured by different electrical concerns. These jobbing distributers see a considerable advantage to the merchandising section of the industry since the action will go a long way toward standardizing their stock and permit millions of dollars of capital to be released from the industry. As a logical result of this it is likely that the jobbers will be able to effect a more rapid turnover, which will mean that they can operate on a lower margin of profit, and this in turn should ultimately have its effect on prices. This should not be taken to mean, however, that an immediate price revision is in contemplation.

POLE-LINE HARDWARE.—An increase of about 20 per cent in pole-line hardware has gone into effect. Jobbers' stocks of commercial pole-line hardware and line material generally are said to be good in Chicago in spite of the fact that the government has taken a large amount of this material to be used for construction abroad.

CONDUIT.—There is no change in the conduit situation. Only orders with a priority of AA and A are being filled promptly.

PORCELAIN STRAIN INSULATORS.—New prices on porcelain strain insulators have gone into effect. It is stated to be, however, simply a matter of convenience, the adjustment, amounting to a few cents, being made in order to give all jobbing distributers the same discount.

FARM-LIGHTING SETS.—After a meeting of farm-lighting plant manufacturers, a committee has gone to Washington to call upon the Priority Board and learn what is to be the status of the farm-lighting plant business.

INCANDESCENT LAMPS.—The jobbers as yet have felt no effects from the government's ruling on carbon and "gem" lamps. The order is fully understood in the jobbing circles of Chicago, and the government's wishes in the matter will be carried out to the letter.

BOSTON

Business remains good, though all branches of the trade have been severely hit by a temporary increase in labor shortage caused by the epidemic of influenza in this part of the country. Seven hundred telephone operators were out last week on the New England company's system and with business houses short-handed generally it was most difficult to care for orders promptly. Conditions are improving somewhat at this writing. Stocks are in a rather spotty condition at present, though little fear is expressed that essential requirements cannot be met indefinitely. The fourth Liberty loan drive is making fine progress. So far collections continue reasonably good, but credits are being scrutinized with much care. Deliveries show some improvement.

MOTORS.—Factory stocks are showing some enlargement, with little change in prices. For the moment there is not quite so much government local buying, the reason being that orders have been placed for enormous totals of motor equipment to go into plants still under construction, and further extensions of these plants have not in many cases reached the point where bids are wanted on electrical apparatus on the immense scale hitherto attained. The war plant work of the country is being rushed to the limit, but many of these installations have reached the point where mass production can be forced from now on. In a word, the utilization and completion of the great war installations is just now of more concern than designs for new plants. Of course, expansion must continue in many branches of industry as long as the war lasts, and it would not take long to exhaust the existing stocks of motors. Up to 25-hp. rating, certainly, increased manufacturing facilities have been effective in establishing at least a modest reserve for immediate shipment on priority service. The second-hand market is a trifle quiet just now.

TRANSFORMERS.—Stocks are low and prices show a slight tendency to stiffen. No marked advances, however, are noted. Standardization of designs is being discussed rather favorably in the interest of saving material and labor. An important paper on this matter by M. O. Troy of the N. E. L. A. apparatus committee was well received at the New England Section, N. E. L. A., convention at Springfield, Mass., last week. Many central-station men appear ready to fall into line with the committee's suggestions toward reducing the number of sizes, types, etc., as a means of patriotically conserving material and labor. Deliveries range from a few weeks in smaller sizes to a half year or thereabouts in units of 5000-kva. rating.

FLATIRONS.—The market appears almost unlimited in its capacity to absorb present production. Sales are being made with little effort, and the factories are hard put to it to meet the demand. One factory turning out 800 irons a day recently informed the ELECTRICAL WORLD that orders totaling over 25,000 units are on its books. Prices are steady, and the public appears ready to buy without much regard to the 1918 advances.

LAMPS.—An advance, as nearly as could be learned, of about 10 per cent was scheduled for Oct. 1. General co-operation in cutting out carbon and metallized-filament lamps is noted in New England by central stations, dealers and the public. Stocks of standard lamps are now in very fair shape. Increased overtime and night work in war plants are adding somewhat to the consumption of lamps, but there is, on the other hand, a good deal of curtailment in residential, window and street lighting.

WASHING MACHINES.—These products are showing extraordinary popularity, and if enough washers could be supplied business would be amazingly good. Even the smaller homes are coming into the market, and price advances are being well cared for by the deferred-payment plan.

ELECTRIC RADIATORS.—Jobbers are wondering where they will be able to supply the demand for these units if it continues as indicated. The fuel conditions have focused popular attention on the electric heater, and it would not be surprising if exhausted stocks were soon reported here and there.

ATLANTA

The continual agitation and prospects of a fixed price for cotton has tended to cause considerable uncertainty in the cotton states, but no effect is observed in the volume of business transacted at this time, as government work is expanding at the expense of non-essential enterprises, which experience further curtailment.

The recent restriction issued by the Priorities Committee against building will be felt keenly. Housing and building facilities are at a premium at certain points now, which is borne out by the fact that Atlanta alone had only 204 houses for rent in A igust and 36 in September. This condition exists in other industrial centers where large government undertakings are under way.

The Grass Fiber Paper Pulp Company, Moore Haven, Fla., has leased 75,000 acres of saw-grass land and will construct a large plant for the manufacture of paper. R. D. Grier will erect a cotton-spinning mill at North Wilkesboro, N. C. A steam power plant will be installed at present, with ultimate arrangements for hydroelectric power. Tucker & Laxton, Charlotte, N. C., have been awarded the wiring contract for additional construction at Camp Jackson, Columbia, S. C. In conjunction with the half-million-dollar steam turbo-pumping equipment to be purchased by the city of Atlanta, the government will install electrical repumping stations at Hemphill, Atlanta and Buckhead, Ga., for Camp Gordon.

POLES.—The call for these is following closely the steady demand for line material. Prices remain firm and shipments are good.

HARDWARE.—A potential market exists for all classes of small pieces, but government restrictions shut off to a great extent many orders. Shipments are fair and prices are steady.

INSULATORS.—No advance has been recorded during the month. Jobbers are having more difficulty getting glass products and have secured porcelain much more quickly. The tendency is to buy the material that can be delivered in the shortest time.

ELECTRIC RANGES.—Distributers report a fairly good stock on hand. They claim, however, that sales are slowing up slightly on account of the user's doubts regarding the shortage of power in the Southeast and its conservation. It is expected that the retailers will explain conditions and that an increased flow of business will be recorded this fall.

SCHEDULE MATERIAL.—Jobbers state that 80 per cent of sales are for government account, and no cessation in the call is noticed. Deliveries are very good. Prices advanced about 5 per cent during the past week.

SEATTLE--PORTLAND

Retail dealers report an added stimulus in trade due to the constantly expending residence buiding program and the influx of war workers from the Middle West and West. The volume of wholesale trade continues heavy, particularly along industrial lines. Central stations report a healthy activity although no special campaigns to push sales are being waged. The retail trade is considerably perturbed over the question of essential and non-essential products. Jobbers' stocks as a whole in the Seattle territory are low. Prices are holding firm with practically no changes for the past few months. Conservative observers are expecting some increase this fall. The labor shortage, already acute, shows no indications of being relieved. All branches of trade in the Northwest are seriously affected by the new draft, owing to unsettled labor conditions brought about by men leaving old lines of employment for assured war work. The field for employment of women is broadening. Prominent jobbers report that Christmas buying has not yet begun, and no particular interest is being shown in this community. The War Department has ordered the installation of a new cable between Seattle and Port Angeles and Port Angeles and Victoria, B. C. Approximately $120,000 will be expended.

Relief from congestion and delay in delivery of freight after arrival in Seattle yards is promised within ten days by the Railway Administration. Through arrangements with federal shipping board heads, the business men and property owners in Seattle who recently pledged themselves to build homes for war workers are assured that these homes have been put on same basis with reference to priority as houses which the government is erecting at Puget Sound Navy Yard.

Portland jobbers report that, aside from the opening of bids for transformers and motor equipment for a government spruce mill at Vancouver, Wash., and Toledo, Ore., there is practically no movement in power apparatus of any importance. Stock conditions are virtually the same as reported for several weeks. The Jager Shroufe Company, electrical contracting engineer, Portland, has secured contracts for wiring all concrete vessels to be built by the Great Northern Concrete Shipbuilding Company at Vancouver, Wash.; for wiring vessels to be outfitted at the plant of the Pacific Marine Iron Works and for twenty vessels built by the Foundation Company, besides all vessels being built by the Coast Shipbuilding Company and the Supple-Ballin Shipbuilding Company.

Collections for past week were normal, and it is believed that the influence of the present Liberty bond drive will have slight effect on collections for the near future. Credits are being placed quite easily, although no unusual transactions are noted. Retail collections and credits show a very satisfactory condition.

SAN FRANCISCO

The past week marks the end of an old era and the beginning of a new one in which all non-essential work will be automatically wiped off the slate. Pacific Coast electrical jobbers have signed the war pledge to ship no material unless it be for essential work, and they have circulated similar pledges among all electrical dealers and contractors.

Collections are still very fair and shorter in term, some merchants inclosing patriotic appeals to that effect with their invoices.

WIRE.—Some big orders for rubber-covered wire, especially for size No. 14 single-braid solid, are reported. In some cases an average month's total is being sold in one week's time. Shipments of No. 14 wire have increased about 50 per cent over the sales of the corresponding period in 1917. The quantity price in the above size has recently increased by 20 per cent and is now around $16 per 1000 ft. f.o.b. at Pacific Coast houses.

HORNS.—Houses that carry electrical horns report a steady sale, though not of large volume, of 110-volt signals to be direct-connected to the lighting circuit in factories.

SCHEDULE MATERIAL.—Schedule material, such as switches, sockets, cut-outs and sign receptacles, has sharply advanced from 10 to 15 per cent. Deliveries are fair, although Eastern factories are handicapped by the government requirements of brass and copper. Certain kinds of schedule material, such as ⅛-in. cap brass sockets or pendent cap sockets, are more domestic than industrial and will, it is expected here, be restricted by the new patriotic pledges.

LAMPS.—All Pacific Coast jobbers are required to furnish quotas, based upon stocks, shipments and back orders, by which their stocks are adjusted. All such houses have just been advised that their quotas, small though they were, will be still further cut. Most of those lamps will go to factories, because consumers are, it is rumored, to be asked to dispense with one lamp out of four in their homes, thus cutting down maintenance orders. Hand in hand with this comes the news that the lightless nights order of the federal Fuel Commissioner expiring on Oct. 1, northern California having five such nights, southern California two, will be indefinitely extended.

CONDUIT.—Local stocks are miserable. Eastern shipments arrive in fair time but require many months for completion.

Current Prices of Electrical Supplies

New York and Chicago Quotations

THE prices quoted are those prevailing in standard packages of specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the sources of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers. Price variations may be due to difference in grade of products of different manufacturers, to local conditions, or to both.

ARMORED CONDUCTOR, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE AND DISCOUNT PER 1000 FT.—NEW YORK

Single-Conductor

No. 14 Solid	
Less than coil	List
Coil to 1000 ft	10%
No. 12 Solid	
Less than coil	List
Coil to 1000 ft	10%

Twin-Conductor

No. 14 Solid	
Less than coil	$105.00 to list
Coil to 1000 ft	90.00—10%
No. 12 Solid	
Less than coil	List
Coil to 1000 ft	10%

DISCOUNT—CHICAGO

Single-Conductor

No. 14 Solid	
Less than coil	+20% to list
Coil to 1000 ft	List to 15%
No. 12 Solid	
Less than coil	+20% to list
Coil to 1000 ft	List to 15%

Twin-Conductor

No. 14 Solid	
Less than coil	$115.00 to +5%
Coil to 1000 ft	100.00 to +5%
No. 12 Solid	
Less than coil	+20% to +5%
Coil to 1000 ft	5%

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each.
Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	12%
1/5 to std. pkg	20%
Std. pkg	44%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+30% to 12%
1/5 to std. pkg	+5% to 20%
Std. pkg	18% to 44%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.45—$0.46	$0.45—$0.47
12 to 50	40	.40— .41
50 to barrel	.35— 36	.36— 37
Barrel lots	32— 329	33— 329

BATTERIES, DRY—Continued

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40 to $0.44	$0.40 to $0.44
12 to 50	35 to .39	35 to 39
50 to barrel	319 to 342	329 to 37
Barrel lots	289 to 332	299 to 342

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. per Coil	List per 100 Ft.
⅜	250	$5.00
½	250	7.50
⅝	100	10.00
¾	50	13.00
1	50	21.00
1¼	50	26.00
1½	25–50	35.00
2	25–50	45.00
2½	25–50	52.00

NET PER 1000 FT.—NEW YORK

	Less than Coil	Coil to 1000 Ft.
⅜-in. single strip	$75.00	$63.75— 69.75
½-in. double strip	75.00— 82.50	72.00— 75.00
½-in. single strip	100.00	85.00— 93.00
½-in. double strip	100.00—110.00	96.00—100.00

NET PER 1000 FT.—CHICAGO

	Less than Coil	Coil to 1000 Ft.
⅜-in. single strip	$75.00	$63.75 to $64.25
½-in. double strip	78.25 to $78.75	71.25
½-in. single strip	100.00	75.00 to 85.00
½-in. double strip	105.00	93.00 to 95.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, In.	List per Foot	Size, In.	List per Foot
⅜	$0.05½	1	$0.25
½	.06	1¼	.33
⅝	.09	1½	.40
¾	.12	1¾	.47
⅞	.15	2	.55
1	.18	2½	.65

NET PER 1000 FT.—NEW YORK

	Less than $15 List	$15 to $60 List	$60 to $150 List
⅜-in.—	$35.00–55.00	$32.00–35.20	$29.00–30.25
½-in.—	40.00–60.00	35.00–38.40	32.00–33.00

NET PER 1000 FT.—CHICAGO

	Less than $15 List	$15 to $60 List	$60 to $150 List
⅜-in.—	$60.00	$30.00	$26.50
½-in.—	65.00	32.50 to 33.50	29.00

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

Card No. 40

Size, In.	Conduit, List per Foot
⅛	$0.08½
¼	08½
⅜	08½
½	11½
¾	17
1	23
1¼	27½
1½	37½
2	58½
2½	76½
3	

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON—Continued

Size, In.	Couplings, List	Elbows, List
⅛	$0.05	$0.10
¼	06	10
⅜	07	10
½	10	25
¾	13	37
1	17	45
1¼	21	50
1½	28	1.10
2	40	1.80
2½	60	4.80
3		

DISCOUNT—NEW YORK

	¼ in. to ½ in.	¾ in. to 3 in.
Less than 2500 lb.	7% to 12%	9% to 14%
2500 to 5000 lb.	10% to 15%	12% to 17%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	¼ to ½ In.	¾ to 3 In.
Less than 2500 lb.	1.5% to 6.8%	3.5% to 8.8%
2500 to 5000 lb.	4.5% to 10.7%	6.5% to 12.7%

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

List price	$5.00 to $6.00
Discount	30%

CHICAGO

List price	$6.00 to $7.00
Discount	25% to 30%

FUSES, INCLOSED

250-Volt	Std. Pkg.	List
3-amp. to 30-amp	100	$0.25
35-amp. to 60-amp	100	35
65-amp. to 100-amp	50	90
110-amp. to 200-amp	25	2.00
225-amp. to 400-amp	25	3.60
450-amp. to 600-amp	10	5.50
600-Volt		
3-amp. to 30-amp	100	$0.40
35-amp. to 60-amp	100	60
65-amp. to 100-amp	50	1.50
110-amp. to 200-amp	25	2.50
225-amp. to 400-amp	25	5.50
450-amp. to 600-amp	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	30%
1/5 to std. pkg	41%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	30% to 31%
1/5 to std. pkg	40% to 41%

FUSE PLUGS

3-Amp. to 30-Amp.

NEW YORK

	Per 100 Net
Less than 1/5 std. pkg	$6.00 to $8.75
1/5 to std. pkg	5.25 to 7.00

Standard packages, 500. List, each, $0.07

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg	$8.00
1/5 to std. pkg	7.00

Standard packages, 500. List, each, $0.07

LAMPS, MAZDA OR TUNGSTEN

110 to 125 Volts

Regular, Clear:	Std. Pkg.	List, Each
10 to 40-watt—B	100	$0.35
60-watt—B	10	.40
100-watt—B	24	.85
75-watt—C	50	.70
100-watt—C	24	1.10
200-watt—C	24	2.20
300-watt—C	24	3.25
Round Bulbs, 2½-in., Frosted:		
15-watt—G 25	50	.60
25-watt—G 25	50	.60
40-watt—G 25	50	.60
Round Bulbs, 3½-in., Frosted:		
60-watt—G 30	24	.82
Round Bulbs, 4½-in., Frosted:		
100-watt—G 35	24	1.15

DISCOUNT—NEW YORK

Less than std. pkg	List
Std. pkg	10%

DISCOUNT—CHICAGO

Less than std. pkg	List
Std. pkg	10%

LAMP CORD

Cotton-Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft.)	$20.20–$35.90
Coil to 1000 ft	27.18

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$38.00
Coil to 1000 ft	28.00

LAMP GUARDS, WIRE

Standard packages from 50 to 150

NEW YORK

Net per 100	$24.00

CHICAGO

Net per 100	$21.75 to $30.00

OUTLET BOXES

Nos.	List per 100
101—A, A 1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200, S.E., 300, A.X., 1½, 4 S.	30.00
103—C.A., 9, 4R, B 1½	25.00
106—F.A., 7, C.S., 1½, 3 R	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	20%	20%
$10.00 to $50.00 list	30%	30%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $10.00 list	30% to 40%	20% to 35%
$10.00 to $50.00 list	40% to 50%	30% to 45%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	10%
1/5 to std. pkg	20%
Std. pkg	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	5%
1/5 to std. pkg	15%
Std. pkg	25%

PORCELAIN CLEATS—UNGLAZED

Two and Three Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg	$21.00 to $38.00
1/5 to std. pkg	17.85 to 19.00

Standard package, 2200. List per 1000, $20.

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg	$16.80
1/5 to std. pkg	15.80

Standard package, 2200. List per 1000, $20.00

PORCELAIN KNOBS

NEW YORK

Per 1000 Net.	Std. Pkg. 3500 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000 N.C.
Less than 1/5 std. pkg	$16.00 to $20.20	$32.00
1/5 to std. pkg	13.60 to 15.60	27.20

CHICAGO

Per 1000 Net.	Std. Pkg. 3500. 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000
Less than 1/5 std. pkg	$11.70 to $24.00	$33.85
1/5 to std. pkg	10.15 to 20.00	26.60

SOCKETS AND RECEPTACLES

	Std. Pkg.	List
½-in. cap key and push sockets	500	$0.33
½-in. cap keyless socket	500	1.30
½-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+10%
1/5 to std. pkg	List

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	List
1/5 std. pkg	10%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

High Grade:	
30-amp. S. P. S. T	$0.80
60-amp. S. P. S. T	1.20
100-amp. S. P. S. T	2.25
200-amp. S. P. S. T	3.48
300-amp. S. P. S. T	5.34
30-amp. D. P. S. T	1.20
60-amp. D. P. S. T	1.78
100-amp. D. P. S. T	3.38
200-amp. D. P. S. T	5.20
300-amp. D. P. S. T	8.00
30-amp. 3 P. S. T	1.80
60-amp. 3 P. S. T	2.68
100-amp. 3 P. S. T	5.08
200-amp. 3 P. S. T	7.80
300-amp. 3 P. S. T	12.00
Low Grade:	
30-amp. S. P. S. T	$0.42
60-amp. S. P. S. T	.74
100-amp. S. P. S. T	1.50
200-amp. S. P. S. T	2.70
30-amp. D. P. S. T	.68
60-amp. D. P. S. T	1.22
100-amp. D. P. S. T	2.50
200-amp. D. P. S. T	4.50
30-amp. 3 P. S. T	1.02
60-amp. 3 P. S. T	1.84
100-amp. 3 P. S. T	3.76
200-amp. 3 P. S. T	6.76

DISCOUNT—NEW YORK

	High Grade
Less than $10 list	+5% to Net
$10 to $25 list	11% to 15%
$25 to $50 list	14% to 20%
	Low Grade
Less than $10 list	5% to 10%
$10 to $25 list	16% to 25%
$15 to $50 list	24% to 28%

DISCOUNT—CHICAGO

	High Grade
Less than $10 list	+15%
$10 to $25 list	List to 2%
$25 to $50 list	5%
	Low Grade
Less than $10 list	+5%
$10 to $25 list	8%
$25 to $50 list	15% to 16%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single-pole	250	$0.28
5-amp. single-pole, ind	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind	100	.54
5-amp. three-point	100	.54
10-amp. three-point	50	.76
10-amp., 250-volt, D. P	100	.66

10-Amp., 250-Volt Push-Button Switches

	Std. Pkg.	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	.70

SWITCHES, SNAP AND FLUSH—Continued

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+20%
1/5 to std. pkg	List
Std. pkg	15% to 17%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+30% to 10%
1/5 to std. pkg	+5% to 16%
Std. pkg	18% to 25%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar—	List Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	Net to 40%	Net to 30%
$2.00 to $10.00 list	10% to 50%	5% to 40%
$10.00 to $50.00 list	20% to 60%	10% to 52%

DISCOUNT—CHICAGO

	Galvanized	Black
Less than $2.00 list	25% to 40%	20% to 30%
$2.00 to $10.00 list	25% to 50%	20% to 40%
$10.00 to $50.00 list	25% to 64%	20% to 50%

TOASTERS, UPRIGHT

NEW YORK

List price	$6.00
Discount	30%

CHICAGO

List price	$6.35 to $7.00
Discount	25% to 30%

WIRE ANNUNCIATOR

NEW YORK

	Per Lb. Net
No. 18, less than full spools	$0.454–$0.51
No. 18, full spools	.404–.49

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.65 to $0.72
No. 18, full spools	.55 to .605

WIRE, RUBBER-COVERED, N. C.

Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$15.00–$20.00	$13.50–$15.00	$13.00–$14.00
12	23.58–27.10	21.62–23.20	17.05–17.68
10	30.20–39.80	27.45–32.40	23.47–23.75
8	42.74–53.35	38.85–45.70	33.21–33.35
6	61.50–84.40	55.35–72.35	52.58–53.05

CHICAGO

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 2500 Ft.	2500 to 5000 Ft.
14	$22.00–$25.00	$18.00–$22.00	$15.50–$16.50
12	29.46–31.44	29.46–31.44	25.54–31.44
10	41.10–43.84	41.10–43.84	34.62–38.36
8	59.90–61.76	39.90–61.76	50.18–54.04
6	85.31–97.68	85.31–85.47	72.27–85.47

WIRE, WEATHERPROOF

Solid-Conductor, Triple-Braid, Size 4/0 to 3 Inc.

NEW YORK

	Per 100 Lb. Net
Less than 25 lb	$37.75 to $40.40
25 to 50 lb	37.75 to 38.40
50 to 100 lb	34.40 to 36.75

CHICAGO

	Per 100 Lb. Net
Less than 25 lb	$37.00 to $39.70
25 to 50 lb	36.00 to 38.72
50 to 100 lb	35.00 to 37.72

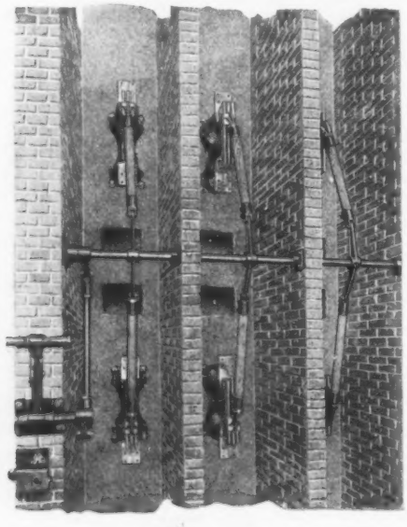
NEW APPARATUS & APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Steel Switching Cabinets

To be installed in locations where conditions are exceptionally hard on switching apparatus, a steel switching cabinet made for single-phase, quarter-phase and three-phase circuits in capacities up to 300 amp. at 15,000 volts and 800 amp. at 600 volts has been placed upon the market by the General Electric Company of Schenectady, N. Y. All current-carrying parts in this unit are inclosed, and provision is made for bringing the leads out at the top, bottom or sides of the unit. The cabinet consists primarily of instrument transformers, oil circuit breakers and disconnecting switches inclosed in a sheet-steel compartment with instruments, operating levers, etc., mounted on the sheet-steel front.

The oil circuit breaker is mechanically interlocked with the disconnecting switch so that this switch cannot be opened or closed while the oil circuit breaker is closed. The disconnecting switch is operated by means of a special handle or wrench from the front of the panel and is so interlocked that the rear door cannot be opened while the switch is closed, nor can the switch be closed while the door is open. This makes it impossible for any one to gain admittance to the compartment while the current-carrying parts are alive.



INTERIOR AND FRONT VIEWS OF COMPLETE SWITCHING UNIT

These contrivances have been designed for use as distribution and tying-in switches, as control switches for induction and synchronous motors, etc. They are usually mounted as a single unit but may be installed in groups if desired. When made with a drip roof the switching cabinet is particularly adapted to use in mines or other damp places. It can be made proof against water, gas and dust and can also be used to control large motors in steel and cement mills, pumping plants, etc., where conditions often exist which cause the switching apparatus to become damaged and put out of service by dust, moisture or chains from traveling cranes.

Fittings for Cartridge Fuse Cut-Out

Owing to the increased use of motor-driven machinery in textile mills, the Appleton Electric Company of Chicago has designed the fitting shown herewith to meet the demand for a suitable device in which to mount a cut-out and attach a projected snap switch. The fitting will accommodate either the Bryant or General Electric snap switches with protective covers. Such an installation gives absolute protection to the inclosed parts from mechanical injury, it is said. This fitting is to be known as the type ZG "unilet."

GIVES PROTECTION AGAINST MECHANICAL INJURY

Polyphase Induction Motor

No auxiliary starting apparatus is required for a polyphase induction motor that is being manufactured by the Triumph Electric Company, Cincinnati, Ohio. The motor automatically controls the starting current within predetermined limits and eliminates the "personal equation" of the operator. It has a starting torque three and one-half times that of an ordinary motor started through an auto-transformer. The efficiency and other operating characteristics are said to be very high, and no open circuit or disruptive discharge voltages are present in the rotor windings. The motor can be operated from any convenient point, no matter how distant. The manufacturer claims that the motor is simple, reliable, durable and efficient.

The rotor of this motor is star-wound, each leg of the star being two or more

INDUCTION MOTOR WITH HIGH STARTING TORQUE AND EFFICIENCY

sections of different resistances connected through a centrifugal switch, so that when the switch is in the open position all windings are in series and of the proper total resistance to meet the starting conditions. When the switch is in the closed position the windings are connected in separate and distinct stars which divide their loads in proportion to the generated voltage in each and its impedance. The cycle of operations is as follows: The main line switch, installed at any convenient point, is closed. The current flowing to the motor is limited to a predetermined maximum by the total resistance of all the windings. Because of the high starting torque of this type the rate of acceleration is rapid. At approximately three-quarters synchronous speed the centrifugal switch closes, providing a low and high resistance path for the current to follow. Both windings are effective in producing torque, which brings the motor quickly to full speed. When the main line switch is opened the motor comes to rest, the centrifugal switch opens, and the windings are then properly connected for starting.

One claim that is made for this motor by the manufacturer is that the centrifugal switch never opens a circuit in which current is flowing, and that in closing it merely shunts current out of the closed circuit; also that the contacts carry only the difference of current in two circuits. There is, therefore, no disruptive discharge or open-circuit voltage which might endanger the insulation.

Double-Pole Switch and Watertight Junction Box

Designed for marine and navy use, a watertight combination double-pole switch and junction box is said to be very well designed. The switch is of very heavy construction and has a watertight plunger key control. The mechanism is of positive, quick-acting,

QUICK-ACTING AND POSITIVE MECHANISM

make-and-break type, breaking on both sides of the circuit at two points. The brass parts for current carrying are unusually rugged and the insulating portions are of high-heat-molded material. This device is manufactured by the Benjamin Electric Manufacturing Company, 806 West Washington Boulevard, Chicago, Ill.

Flush Tumbler Switches

Ample room is provided for the wires and brass plate in a tumbler switch that is being manufactured by the Duncan Electrical Company, Ltd., Montreal, Canada. The accompanying illustra-

SWITCH MAY BE ATTACHED TO ANY STANDARD BOX

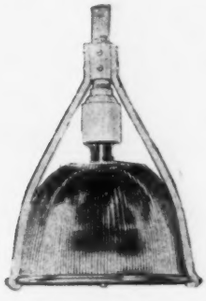
tion shows how easily this switch and a brass plate may be attached to any standard metal box. The switches are rated at either 3 amp. at 250 volts or 5 amp. at 120 volts.

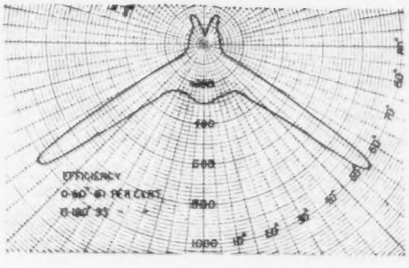
Wide Beam Reflector for Floodlighting Unit

The National X-Ray Reflector Company of Chicago has placed upon the market a reflector known as No. 810 which is adapted for use with the No. 51 floodlight projector also manufactured by this company. This reflector is manufactured in both corrugated and plain types. It is said to produce a wide distributing beam of light. The manufacturer claims that this can easily and simply be placed in the reflector.

Industrial Lighting Units

In line with the requirement of the War Industries Board that manufacturers in their designs are to eliminate multiplicity of sizes and shapes, the Holophane Glass Company, 340 Madison Avenue, New York City, has placed on the market an industrial lighting unit which is made in two types to produce an extensive and an intensive distribution of light. Two sizes of units are made to accommodate all gas-filled-lamps in sizes from 75 watts to 500





UNIT GIVES HIGH ILLUMINATION ON VERTICAL SURFACES

watts. The correct lamp position for each is obtained by a simple adjustment to the sliding collar, the stem being calibrated for the various sizes of lamps.

The distribution curves have been predetermined to give uniform illumination, high illumination on vertical surfaces and absence of glare, the makers say. The high efficiency of 93 per cent in the 0-180 deg. zone and 61 per cent in the 0-60 deg. zone is said to be obtained.

Some of the advantages claimed for this unit are: high efficiency, absence of glare, high illumination on vertical surfaces, ease of cleaning, freedom from deterioration, softening of shadows, mechanical strength, simplicity, shielding of the light source, low brightness of inside lower edge of reflector, the light given to the ceiling design of the holder on the ice-hook principle, uniform illumination between units, and that it comes complete ready to install.

Direct-Connected Farm Lighting Unit

For use where buildings are not too widely scattered, the Western Electric Company, Inc., 195 Broadway, New York City, has developed a direct-connected farm-lighting set. This 32-volt outfit, designed for power and light purposes complete, is made up of a direct-connected set, a storage battery of sixteen cells and a control board mounted on the base which contains circuit breaker, fuses, automatic control apparatus and meters. By pressing the starting lever on the control panel the generator of the set operates as a motor, turning the engine over and causing it to operate on its own power. The automatic engine stop shuts down the engine when the batteries are charged and opens the circuit between generator and battery when the engine stops. Another switch is located on the control panel which cuts off the generator, so that all the power of the engine can be used to drive machinery from the auxiliary pulley if desired. The current indicator on the control panel shows whether the battery is being charged or discharged. Besides the starting lever there are three switches on the panel—one for giving the battery the periodic soaking charge, this switch being one of the features in the dual-control charging method of this outfit The generator of this set is specially designed and the engine operates in such a manner as to give a tapering charge to the battery. This tapering charge allows just the right amount of current to flow in the battery, and when the charge is completed the engine is automatically stopped by the little device on the control panel. In addition to the tapering charge given regularly to the battery an occasional soaking charge is provided for by the battery switch. This combination of tapering charge and periodic soaking charge offers a dual control of battery charging and is the best method for charging a battery, according to the makers.

Rigid Shade Holder

Only one screw is required to adjust a shadeholder that has been placed upon the market by the Duncan Electrical Company, Ltd., Montreal, Canada. This

SHADEHOLDER FOR STANDARD EDISON SOCKET

device is known as the "Rigid" and is made 2½ in. (6.4 cm.) in diameter to fit in the standard Edison socket. As shown in the accompanying illustration, two of the clamps are non-adjustable.

Trade Notes

FUSION IN SWEDISH BALL-BEARING INDUSTRY.—An important fusion will shortly take place within the Swedish ball-bearing industry, according to Commercial Agent Norman L. Anderson, the Nordiska Kullager company having bought the majority of shares in the Baltiska Kullager Company. The Baltiska Kullager concern has a capital stock of 8,000,000 crowns (approximately $2,000,000) and the Nordiska Kullager concern will therefore have to extend its capital with 4,000,000 crowns (approximately $1,000,000), whereby the capital of this company will be nearly 22,000,000 crowns (approximately $5,500,000). Last year the Nordiska Kullager company paid a dividend of 10 per cent.

NEW ESSINGTON WORKS EXCEED SCHEDULE BY 50 PER CENT.—The shipyards of the country, which at the present time are working at utmost speed in fulfilling the government's tremendous shipbuilding program, are in a large part entirely dependent upon the manufacturers who produce the necessary machinery that goes into these ships. These manufacturing establishments are doing more than what is demanded of them toward winning the war and filling the government's orders. The war-time spirit has been well demonstrated by the Essington Works of the Westinghouse Electric & Manufacturing Company in South Philadelphia. Their record for the month of August was not only larger than the shipment for any similar time since the works commenced operations, but it was actually 50 per cent in excess of what the schedule called for. These works have concentrated their efforts upon the construction of ship propulsion machinery, such as steam turbines, mechanical reduction gears, condensers, pumps and other auxiliary steam apparatus, all of which comprise the Westinghouse marine power system. One hundred per cent of the material being turned out is on government contracts, and 90 per cent of it goes to the United States Navy.

E. F. DUNLAP, city electrical inspector of the city of Portland, Ore., has become Oregon representative of the Economy Fuse Company, being away on a temporary leave of absence from the city department.

JAMES H. GILHULY, San Francisco, Cal., representative of the Youngstown (Ohio) Sheet & Tube Company, has been elected vice-president of the Electric Agencies Company, special representative of the Youngstown company on the Pacific Coast.

THE NORTHEAST ELECTRIC COMPANY, manufacturer of automobile electrical supplies, is soon to open a branch factory in Atlanta, Ga., according to an announcement recently made by the assistant secretary of the Atlanta Chamber of Commerce. The building at 55 West Peachtree Street is now in the process of construction and, it is understood, will be ready for occupancy shortly.

E. O. SHREVE has been promoted from assistant manager to manager of the San Francisco office of the General Electric Company. Graduating from the Iowa State College and receiving his apprentice work at Schenectady Mr. Shreve went West in 1906. He passed successively through the stages of salesman at the San Francisco office, manager of the Reno (Nev.) office, turbine expert at San Francisco, manager of the supply department at San Francisco, and finally to his present post.

YOUNG & RUSSELL, Philadelphia, manufacturers of gas and electric portable lamps, have notified the trade that because of the serious paper shortage and shortage of printers they will not publish a catalog this year. The last edition of their catalog is entirely exhausted. They have, however, made special arrangements for customers to inspect their line, which is on display in the showrooms of E. W. Hammond, 10 West Twenty-third Street, New York City, and Himmelstern Brothers, 718 Mission Street, San Francisco, Cal.

THE UNIVERSAL MOTOR COMPANY of Oshkosh, Wis., reports that it has just made the first shipment of its generating systems direct to Uruguay. This shipment consisted of three 4-kw. sets. The company has already secured representation in the city of Montevideo with the Enrique Abals Company. The company states that the need of generating outfits in the remote districts, and even in many of the larger towns of Uruguay, makes it safe to say that increased attention will be paid to this product by American manufacturers of generating sets.

Changes in Bryant Electric's Sales Staff

GEORGE V. W. INGHAM, who was recently appointed Eastern sales manager of the Bryant Electric Company, was educated in the public schools of Syracuse, N. Y., and at Syracuse University. For several years he engaged in the typewriter business in Syracuse and in the fall of

G. V. W. INGHAM

1906 removed to Chicago as Western manager of Pass & Seymour of Syracuse, N. Y., joining the Bryant company in 1911. For twelve years he has traveled constantly through the western sections of the country.

FREDERICK B. EAVES, who has been field representative of the company in New England, New York State and eastern Canada for the last seven years, has been given indefinite leave of absence in order that he may serve in the electrical and power equipment section of the War Industries Board in Washington. This section is assisting all electrical manufacturers and resale distributers of electrical equipment, apparatus, appliances and supplies to mobilize their resources for direct and indirect war needs.

WALTER E. NOURSE, formerly New England representative of the Square D Company, succeeds Mr. Eaves.

WILLIAM O. DAHLSTROM, for the last three years with the Inland Electric Company of Chicago, returns to the Chicago office of the Bryant company, with which he previously served for ten years, and will be the company's field representative in the territory west and northwest of Chicago, the territory formerly traveled by Mr. Ingham.

Trade Publications

ROOF PAINT.—The Monarch Paint Company, Cleveland, Ohio, has issued a circular describing its Hydro-Carbonite paint for roofs and iron.

PREFERENCE LIST.—Preference List No. 2, issued Sept. 3, 1918, may now be had in booklet form (Circular No. 20 War Industries Board, Priorities Division). The booklet includes a list of plants having preference.

INCLOSED SWITCHES.—The Trumoull Electric Manufacturing Company, Plainville, Conn., is distributing a catalog illustrating and describing boxes for inclosing switches and fuses. The switches are operated by means of external handles.

METAL REFLECTORS AND FITTINGS.—Catalog No. 276 issued by the Ivanhoe-Regent Works, General Electric Company, Cleveland, Ohio, contains information regarding the design of lighting systems as well as detailed catalog information about metal reflectors and fittings.

ELECTRIC HEATING APPLIANCES.—The Hotpoint Division of the Edison Electric Appliance Company, Inc., 5660 West Taylor Street, Chicago, has issued a catalog and price list of Hotpoint electrical appliances as of July 15, 1918.

ELECTRIC FURNACES.—Four catalogs are being distributed by the Electric Furnace Company, Alliance, Ohio. One describes and illustrates the use of Baily electric furnaces in the production of war materials, including the treatment of airplane parts, the treatment of shells and for the melting of aluminum in bronze or submarine castings. Another catalog gives the general description, dimensions, capacity and power requirements of electric brass-melting furnaces. It includes also a discussion and table of comparative costs of melting brass of fixed ingredients by electricity, oil and coke. A third catalog states the advantages of electric furnaces over fuel-fired furnaces and compares the relative economy of furnaces supplied by oil, gas, coal and electricity, showing prices of each which make the costs equal for all fuels. This catalog is profusely illustrated with pictures of furnaces used for the treatment of steel and melting of bronze. The fourth bulletin contains a description of the Baily automatic electric furnaces for heat treatment of high explosive and shrapnel shells. The process of treating the shells is very fully described and illustrated. Data are also furnished showing the over-all dimensions of furnaces, the heating capacity and the power required.

New Incorporations

THE ELECTRICAL NECESSITIES COMPANY of Cleveland, Ohio, has been incorporated with a capital stock of $20,000 by Guy A. Burgess and others.

THE MORRIS (N. Y.) LIGHT & POWER CORPORATION has been incorporated with a capital stock of $10,000, by H. and E. C. Linn and G. Whitman of Morris, N. Y.

THE ACORN INSULATED WIRE COMPANY of Brooklyn, N. Y., has been incorporated with a capital stock of $300,000 by F. and W. R. Prosser and W. George, 102 Dean Street, Brooklyn, N. Y.

THE BEATRICE ELECTRIC COMPANY of New York, N. Y., has been chartered with a capital stock of $5,000 by W. E. Lamboen, F. M. Stackman and B. M. Johnson, 1245 Putnam Avenue, Brooklyn, N. Y.

THE McDONALD STORAGE BATTERY COMPANY of Clarksburg, W. Va., has been incorporated with a capital stock of $10,000 by Frank C. Welch, M. E. McDonald, Aimee McDonald, Maud Walsh and John F. Kearns, all of Clarksburg.

THE PLEASANT MILLS (IND.) LIGHT & POWER COMPANY has been incorporated by Amos W. Gulick, Edward Koos, E. T. Jones, Amos Z. Smith and others. The company is capitalized at $5,000 to construct and operate an electrical distributing system.

THE PENN ELECTRIC SMELTING CORPORATION of New York, N. Y., has been incorporated with a capital stock of $100,000 by C. Batcheller, W. W. Gephart and D. P. Earlie, 165 Broadway, New York City. The company proposes to operate a plant for milling, smelting, concentrating and refining metals.

THE PREMIER INCANDESCENT LAMP WORKS of New York, N. Y., has been incorporated with a capital stock of $30,000 to manufacture incandescent lamps. The incorporators are: A. Emerson, 518 West 135th Street; W. L. Morck, 476 West 143d Street, and J. S. Epstein, 362 Riverside Drive, New York City.

THE MONTAGUE-HOWLAND ELECTRIC COMPANY of Lincoln, Me., has been incorporated with a capital stock of $10,000 to do a general electrical business in Enfield and Howland. The officers are: S. N. Marsh of West Enfield, president; J. A. Thompson of West Enfield, treasurer, and William C. Kirk of Lincoln Center, clerk.

THE LITSCHER LITE CORPORATION of Grand Rapids, Mich., has been incorporated with a capital stock of $100,000 to manufacture and sell electric power and lighting plants for farms and detached localities. The officers of the company are: Christopher J. Litscher, president and treasurer; Fred N. Rowe, vice-president; W. Russel Patton of Milwaukee, Wis., secretary and sales manager.

New England States

ASHLAND, N. H.—Work has begun on the construction of a new power plant, 50 ft. by 50 ft., at the works of the Ashland Woolen Mills.

PENACOOK, N. H.—The Stanish Worsted Company, it is reported, has leased the local power station of the Concord (N. H.) Electric Company to furnish electricity for lighting its mill.

BURLINGTON, VT.—The Board of Aldermen is considering a new contract from the Burlington Light & Power Company to furnish hydroelectric power for the municipal electric lighting system. The board will also take up the question of securing energy from the electric company at Fairfax Falls, which, it is understood, has submitted a proposal to furnish electricity to operate the municipal plant.

BOSTON, MASS.—Bureau of Yards and Docks, Navy Department, Washington, D. C., is planning to call for new bids for an addition to the machine shop and foundry at the Charlestown Navy Yard, Boston, to cost about $900,000. No bids were submitted on the former call.

CHICOPEE, MASS.—Work has been begun on the construction of a power house for the Dana S. Courtney Company.

TAUNTON, MASS.—The Narragansett Electric Light Company has submitted a new proposal to the City Council for furnishing electricity for the municipal electric light system.

NEW LONDON, CONN.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 14 under Specification 3385, for distributing system to cost about $275,000.

Middle Atlantic States

CHAMPLAIN, N. Y.—The property of the Electric & Milling Company together with the Nye water power is reported to have been purchased by R. E. Lapham and C. E. Sample.

HUDSON, N. Y.—Bids will be received by Mrs. Annie Windsor Allen, president board of managers, New York Training School for Girls, Hudson, until Oct. 11, for electric work on additional lights, Cottages 5, 7 and 10, at New York Training School for Girls. Drawings and specifications may be consulted at the above school, at the New York office of the Department of Architecture, 1224 Woolworth Building, and at the Department of Architecture, Capitol, Albany. Lewis F. Pilcher, Capitol, Albany, is architect.

LOCKPORT, N. Y.—Contract has been awarded by the Board of Supervisors of Niagara County to the Dunlap Electric & Motors Company, 54 Pine Street, for the installation of new electric lighting fixtures, etc., at the county institution.

TOTTENVILLE, N. Y.—Arrangements, it is reported, have been completed by the Richmond Light & Power Company for extensive improvements and extensions to its plant and system. The United States government, it is understood, will finance a loan to the company of about $600,000, to provide funds for the work.

SYRACUSE, N. Y.—The Syracuse Lighting Company has announced that no additional extensions or installations will be made except to provide for war work and that no new contracts for power will be entered into until further notice.

CAMDEN, N. J.—Plans have been prepared by the Public Railway Company for the construction of a new administration building at its terminal at Broadway and Morgan Street, near the plant of the New York Shipbuilding Corporation.

NEWARK, N. J.—The Instant Electric Vaporizer Company, recently organized, proposes to operate a plant at 52 Grove Street, in the Irvington section, for the manufacture of electric evaporizers and kindred electric specialties. Frank F. Jackson is interested in the company.

NEWARK, N. J.—A. P. Munning & Company, 202 Emmet Street, Newark, recently incorporated to manufacture electrical specialties, will take over the present plant of the Munning-Loeb Company, Church Street, Matawan. It is proposed to increase the capacity of the works and move the Newark plant to the Matawan site. New buildings, it is said, will be erected later on. The company is capitalized at $500,000.

ROCKAWAY, N. J.—Plans have been completed by the Empire Steel & Iron Company for the installation of a turbo-generator unit at its plant at Mount Hope to replace the one now out of commission.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

SUMMIT, N. J.—The Board of Public Utility Commissioners has granted the Commonwealth Electric Company permission to issue $22,000 in bonds and $6,000 in capital stock, the proceeds to be used, it is understood, for extensions.

TRENTON, N. J.—A number of buildings are being acquired by Charles W. Brick of Trenton in connection with the establishment of an ice-manufacturing plant. Plans, it is understood, are under consideration for the installation of a new electric plant.

CHAMBERSBURG, PA.—The Chambersburg Plumbing & Heating Company has been awarded a contract by the Railroad Administration for installations at Hagerstown and Chambersburg, amounting to approximately $30,000. The work at Hagerstown includes the erection of power house, car and passenger station and heating installation with a system of underground piping in concrete conduits. The company will also install a fan system of heating for the foundry building of the Chambersburg Engineering Company.

MILTON, PA.—To provide power for the Milton Manufacturing Company, which is engaged in manufacture of munitions and supplies for the army, the War Department has authorized the construction of a 4000-kw. electric plant with necessary equipment, to cost $350,000. The company eventually will take over the plant, paying for it by deducting a certain portion on future contracts.

PHILADELPHIA, PA.—The Delaware Storage & Freezing Company, American and Callowhill Streets, is contemplating building an addition to its engine plant.

PHILADELPHIA, PA.—Plans have been prepared by the Delaware Storage & Freezing Company, American and Callowhill Streets, for alterations and improvements in the engine plant at its works.

PHILADELPHIA, PA.—Plans are being prepared by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for structural-steel shop, machine shop, smith and electrical shop to be erected at the League Island Navy Yard, Philadelphia. Plans are also under way for a second machine shop and machinery building and electrical shop at the navy yard, and for a new aircraft factory, hangars and allied buildings. Contract has been awarded to the George F. Pawling & Company, 1422 Penn Square, for the construction of new seaplane hangars.

PITTSBURGH, PA.—Arrangements, it is understood, are being made by the receivers of the Pittsburgh Railway Company to apply to the United States for authority to expend about $1,000,000 for improvements to the system.

SUNBURY, PA.—The Borough Council has accepted the report of Ballard & Company, electrical engineers, on the appraisal of the electric plant and system of the Northumberland County Gas & Electric Company. The report places the value of the plant at $135,000 and the total cost of placing the plant in condition to generate electricity at $200,000. The proposal to authorize a loan of $225,000 for the purpose of taking over the plant will be submitted to the voters at the general election in November.

WILKES-BARRE, PA.—Contract has been awarded by the Market Realty Company, East Market Street and Pennsylvania Avenue, to the Pine & Minick Company of Buffalo, N. Y., for the erection of a one-story power house, 30 ft. by 80 ft.

BALTIMORE, MD.—Contract has been awarded by the United Railways & Electric Company, Continental Building, to the Singer-Pentz Company, Equitable Building, Baltimore, for the erection of a service station, including electric lighting and heating plant at Columbia Avenue and Baltimore & Ohio Railroad tracks.

MOUNTAIN LAKE PARK, MD.—A committee has been appointed to take steps to have two charters governing the town repealed and to procure a new charter giving the community the right to own and operate an electric light and power plant and waterworks system and other public improvements. Alexander Zeck, Lee M. Bender and others are members of the committee.

FAIRMONT, W. VA.—The Monongahela Valley Traction Company is contemplating an addition to its power plant at Hutchinson.

LOGAN, W. VA.—The Guyan Machine Shops would like to receive prices on a low-voltage generator and magnet wire.

ALEXANDRIA, VA.—Plans are being prepared by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for the construction of a torpedo-assembling works at Alexandria, to cost about $950,000.

PETERSBURG, VA.—Notice has been filed by the Petersburg Telephone Company of an increase in capital stock from $200,000 to $300,000, the proceeds to be used for expansion.

PORTSMOUTH, VA.—The United States government plans an expenditure of $10,000,000 to acquire, improve and operate the public utilities in the Norfolk-Portsmouth section. The War Industries Board has authorized an expenditure of $1,000,000 for electric power and gas facilities during the period of the war, to include high-tension power connections between Richmond, Petersburg, Suffolk, Portsmouth and Norfolk, additions to power plants in all cities and ultimate connection with hydroelectric developments on Roanoke River, upon which the government will expend several million dollars. The board has also loaned the traction companies $1,100,000 for street-railway improvements in Portsmouth and Norfolk. Rear-Admiral F. R. Harris, president of the board of control of war construction activities for Hampton Roads district, is in charge of the work.

YORKTOWN, VA.—Contract has been awarded by the Bureau of Yards and Docks, Navy Department, Washington, D. C., to the F. W. Mank Construction Company, Finance Building, Philadelphia, Pa., for the erection of a new fuel oil plant with equipment at Yorktown, to cost about $600,000.

WASHINGTON, D. C.—Plans are being prepared by the War Department for the construction of a power plant and laundry building at Camp Meigs, near Washington, to cost about $150,000.

WASHINGTON, D. C.—Bids will be received at the general engineer depot, U. S. Army, 1438 U Street, Washington, D. C., until Oct. 8 as follows: Proposal 1123—145 60-in. parabolic searchlight mirrors; Proposal 1126—30,000 high intensity carbons for use with searchlights.

WASHINGTON, D. C.—The United States government is planning to erect a radio and wireless station in Union County, N. C., probably at Bakers, about 4 miles from Monroe. The plans provide for erection of twenty separate wireless stations, to cost $135,000 each. The total cost is estimated at $2,700,000. For further information address Captain David W. Todd, director naval communication, Washington, D. C.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: Philadelphia, Pa., Schedule 6092½—telephone cable; Philadelphia and Norfolk, Schedule 6139½—seven electric locomotives and a number of platform cars. New York, N. Y., Schedule 6099½—insulating tape; Schedule 6126½—50 instrument boxes, South Brooklyn, N. Y., Schedule 6104½—three telephone switchboards. Newport, R. I., Schedule 6108½—50,000 ft. wire cable. Great Lakes, Schedule 6131½—Six 5 hp. motors and one coal crusher; Schedule 6157½—3000 lb. weatherproof wire, 5000 ft. lamp cord, 25 lb. magnet wire and a quantity of rubber-covered wire. Washington, D. C., Schedule 6120½—One slotting machine, one oil press transformer and one testing transformer; Schedule 6230½—One electrically operated grab bucket. South Boston, Mass., Schedule 6133½—lighting wire. Gloucester, N. J., Schedule 6137½—insulators, wing type clamps, wire and 100 exciter battery base mounts. Norfolk, Va., Schedule 6140½—10,000 ft. stranded cable; Schedule 6179½—cable; Schedule 6180½—400 ft. copper wire; 6181½—electrical material. F.o.b. works, Schedule 6143½—2500 cast brass junction boxes and covers; Schedule 6172½—30,000 cast brass switch boxes; Schedule 6174½—switch cams; Schedule 6188½—7000 switch boxes; Schedule 6198½—one condenser; Schedule 6201½—160,000 receptacle caps; Schedule 6200½—30,000 cast-brass switch boxes. Hoboken, N. J., Schedule 6144½—one refrigerating plant. Newport, R. I., Schedule 6147½—8000 lb. copper tubing. Hingham, Mass., Schedule 6152½—160,000 ft. line telephone wire and 50,000 ft. copper telephone wire; Schedule 6153½—telephone supplies; Schedule 6154½—telephone hardware; Schedule 6155½—cross-arms and telephone poles. White Plains, Md., Schedule 6185½—switchboards. New Orleans, Schedule 6229½—radio ap-

paratus and spare parts. Brooklyn, Schedule 6231½—128 searchlight bases and trunion arms. Various yards, Schedule 6247½—electrical supplies, including projectors, wire, etc. Puget Sound, Schedule 6259½—one refrigerating apparatus and spare parts. Applications for proposal blanks should designate the schedule desired by number.

North Central States

AKRON, OHIO.—C. W. Baum, safety director, has applied to the Capital Issues Commission for authority to expend $50,000 for improvements to the fire and police signal system.

DEFIANCE, OHIO.—The property of the Auglaize Power Company was purchased by W. P. Wallace of Defiance at a receiver's sale on Sept. 14 at $680,650.

HAMILTON, OHIO.—The City Council has granted the Henry Ford Company permission to erect an electric transmission line from the plant of the Hamilton & Hydraulic Company to the site of the new works of the Ford Company.

ANDERSON, IND.—Contract has been awarded by the Board of Public Works to the Hatfield Electric Company of Indianapolis for three boilers and stokers, to cost about $94,400, for the municipal electric light plant.

BLOOMFIELD, IND.—The capital stock of the Indiana Power & Water Company has been increased from $500,000 to $1,000,000.

SOUTH BEND, IND.—The Board of Public Works is considering replacing the present ornamental cluster lamp standards with single lamp standards.

CHICAGO, ILL.—Plans for an army reconstruction hospital to be erected by the United States government at Speedway Park, Chicago, near Maywood, will include shops and instruction buildings, in which soldiers will be fitted for occupations to make them self-supporting. The total cost of the hospital is estimated at $4,500,000, of which $3,500,000 will be for land and buildings and the remainder for equipment. The Shank company has the general contract. Twenty-eight buildings will be erected, the main structure to be 2040 ft. long and four stories high and to be completed in 100 days. It will be known as the United States General Hospital and will be designated by a number.

DECATUR, ILL.—Investigations are being made by the City Council relative to securing water power from the new dam.

GALESBURG, ILL.—The Dependable Truck & Tractor Company of Galesburg has purchased a site just north of Galesburg, consisting of five acres and a building containing 45,000 sq.ft. which the company will repair and use as a temporary building in which to assemble its first trucks. This building will later be used as a machine shop and power house. Plans have been prepared by the company for the construction of a factory building consisting of approximately 40,000 ft.

HAVANA, ILL.—The installation of a municipal electric light plant in Havana is reported to be under consideration.

BIRON, WIS.—L. A. DeGuere, consulting engineer, has been engaged by the Consolidated Water Power & Paper Company to prepare plans and supervise the construction of an addition to its hydroelectric power plant in Biron. The cost is estimated at $75,000.

LITTLE FALLS, MINN.—The property of the Little Falls Water Power Company has been purchased by L. P. Runkel, H. C. Hornby, H. C. Stevens and A. L. Lynds of Cloquet, owners of the General Light & Power Company of Cloquet. The new owners plan improvements to the system and a contract has been let to concrete the west wing of the dam. L. P. Runkel has been appointed general manager of the new company. T. C. Gordon, present manager, will continue in that capacity for the new concern.

NEW MUNICH, MINN.—The Council is considering the purchase of new electrical equipment.

MUSCATINE, IOWA.—Bids will be received by the Muscatine-Louisa Drainage District No. 3 at the office of the County Auditor of Muscatine County, Muscatine, Iowa, until Oct. 8 for a steam-driven pumping plant, complete, containing one each 36-in. and 24-in. double-suction centrifugal pump. Bids will also be received for building to house said plant. Further information may be obtained on application to the Elliott & Harman Engineering Company of Peoria, Ill.

KENNETT, MO.—O. B. Gwyn, superintendent of the Gideon-Anderson Lumber Company, is contemplating the construction of a 12-ton ice plant, bottling works and electric-lighting system in Kennett.

ST. LOUIS, MO.—The Oliver Electric & Manufacturing Company, 2219-21 Lucas Avenue, is reported to have purchased a site on Forest Park Boulevard, east of Boyle Avenue, on which it proposes to erect a new plant. Work, it is understood, will begin on construction of the proposed plant at once. Fielding W. Oliver is president.

COLONY, KAN.—The local electric light plant is reported to have recently been destroyed by fire.

FREDONIA, KAN.—A petition has been presented to the Council urging the establishment of a municipal electric light plant.

LEAVENWORTH, KAN.—Bids will soon be asked for construction of community school, including heating, wiring and plumbing. The cost of the building is estimated at $90,000. T. W. Williamson & Company, 418 Central National Bank Building, Topeka, are architects.

PERU, KAN.—Plans have been prepared by Archer & Stevens, engineers, New England Building, Kansas City, Mo., for improvements to the electric light and water plant. The cost is estimated at $25,000. Fred Mallonee is city clerk.

WAMEGO, KAN.—The City Council has passed an ordinance authorizing the Riverside Light, Power & Gas Company of Abilene to erect an electric transmission line through the west city limits to the Wamego municipal light and water plant and from there to the Young Alfalfa and Lord flouring mills; also for the erection of a transformer station and to furnish electricity to the municipal plant and manufacturing industries in Wamego.

Southern States

BELHAVEN, N. C.—Bids will be received by the Mayor and Board of Aldermen, Belhaven, until Oct. 8 for furnishing and erecting one 100-hp. crude-oil engine and appurtenances, one 90-kva., 2300-volt engine-type alternator, with exciter and switchboard, and also for construction of power house. Proposal forms and further information may be obtained from William M. Piatt, engineer, Durham, N. C.

GASTONIA, N. C.—The capital stock of the Piedmont Telephone Company has been increased from $400,000 to $600,000, the proceeds to be used for extensions and improvements.

NORTH WILKESBORO, N. C.—A company has been organized by R. D. Grier, Clem Wrenn and others to erect a cotton mill at Gordon, a suburb of North Wilkesboro. The proposed mill will be operated by steam power at first, but later it is planned to secure water power. The company is capitalized at $250,000.

ST. PAUL'S, N. C.—Plans have been prepared for changing the motive power of the St. Paul's Mills from steam to electricity.

TARBORO, N. C.—The City Council has approved of a $50,000 bond issue for extensions and improvements to the municipal electric light plant.

CHATTANOOGA, TENN.—The construction of a separate lighting plant for the county is recommended by W. A. Conner, county judge.

NASHVILLE, TENN.—The City Commission has entered into a contract with the Nashville Railway & Light Company for electricity to operate the municipal electric light and power system during the period of the war. The city has closed down the electric generating plant at the request of United States government.

DOTHAN, ALA.—The Columbia Power Company, which is building a hydroelectric plant at Columbia, 29 miles from Dothan, has contracted with the city to furnish 1500 kw. to be delivered at the switchboard in Dothan. The contract was to take effect July 8, but has been extended to Oct. 8. The company has also entered into contracts with the cities of Headland, Alabama, Columbia, Ashford and Webb to furnish electricity.

GADSDEN, ALA.—Plans have been prepared for equipping the pumping station of the waterworks system for electrical operation. Three large pumps with motors and auxiliary equipment will be installed.

MOBILE, ALA.—The City Commission has granted the Mobile Light & Railroad Company a franchise to build tracks on Conception, Texas, St. Emanuel, Delaware, Lawrence and Georgia Streets, to the large shipbuilding plants in the southeastern part of the city. The cost of the improvements is estimated at $110,000 of which 60 per cent will be loaned by the Emergency Fleet Corporation.

NEW ORLEANS, LA.—Arrangements, it is reported, will be made by the New Orleans Railway & Light Company with the New Orleans Belt Railway Company to operate street cars on the belt line tracks. Extensions and improvements, it is stated, to cost about $200,000 will be made.

ARDMORE, OKLA.—The East Ardmore Coal Company of Ardmore is contemplating the purchase of mining equipment, including power plant. J. W. Weeks is interested.

HOUSTON, TEX.—The Houston, Richmond & Western Traction Company has leased dam and water-power rights on the Guadalupe River at Oak Forest, 9 miles from Gonzales, and will build a large hydroelectric plant. Energy generated at the plant will be used to operate the proposed interurban railway between Houston and San Antonio, a distance of more than 200 miles. Surveys have been made for the road and most of the right-of-way has been secured. The height of the dam will be increased from 8 ft. to 15 ft. E. Kennedy of Houston, is president.

Pacific and Mountain States

SEATTLE, WASH.—An ordinance authorizing an appropriation of $10,000 to complete the city substation at Ballard has been introduced in the City Council.

SEATTLE, WASH.—The Puget Sound Traction, Light & Power Company has been granted a permit to erect a substation at 3773 Fourteenth Avenue, Northeast, to cost about $3,500.

CRESCENT, ORE.—The development of a power site at Crescent, it is reported, is under way by Dr. N. E. Winnard of Heppner. The power generated at the plant will be used for pumping water on lands in the Fort Rock district in Lake County.

BUTTE CITY, CAL.—The Great Western Canal Company is reported to be considering the construction of a power plant to develop about 500,000 hp.

MARTINEZ, CAL.—Contract has been awarded by the Town Council to M. P. Holmes of Berkeley for the construction of a pumping station to be used in connection with the new sewerage system, at a cost of about $34,000. The proposed plant, it is understood, will be equipped for electrical operation.

SAN FRANCISCO, CAL.—Application has been made to the State Water Commission by K. E. Enslow of San Francisco, Richard Day and the Adams Pipe Works for water rights on the Middle Fork of the Feather River, to be utilized to develop 25,000 hp. It is proposed to store 50,000 acre-ft. a year in Gold Lake and Grizzly Valley in Sierra County. The same parties have also applied for 250 cu.ft. of the waters of the Middle Fork of the Feather River for the irrigation of 85,320 acres. The main canal will be about 20 miles long.

STOCKTON, CAL.—The first stage of construction of the dam of the Twin Lakes reservoir, which, it is expected, will store 1000 acre-ft. of water for the coming season for the hydroelectric development on the American River near Placeville of the Western States Gas & Electric Company of California, will be completed by Oct. 1. This is the fourth reservoir to be provided the company through the purchase in 1917 of four lakes in the Sierras. The company is controlled by H. M. Byllesby & Company of Chicago, Ill.

CŒUR D'ALENE, IDAHO.—To do away with steam motive power in its local yards the Northern Pacific Railroad Company is now equipping its line within the city limits of Cœur d'Alene for electrical operation.

SALT LAKE CITY, UTAH.—The Public Utilities Commission has granted the Utah Power & Light Company of Salt Lake City permission to furnish the town of Perry with electricity for power and heating purposes, but not for lighting.

CHEYENNE, WYO.—The Nevada-California Power Company, Symes Building, Denver Col., has applied to the State Water Commission at Cheyenne, Wyo., for permission to use 3763 acre-ft. per annum of the waters of Rush Creek, tributary to Mono Lake, for power development. The cost is estimated at $45,000.

Canada

MONCTON, N. B.—The Moncton Tramways, Electricity & Gas Company is considering the construction of an extension to Sunny Brae.

CORNWALL, ONT.—The International Joint Commission has granted the St. Lawrence Power Company, a subsidiary of the Aluminum Company of America, permission to construct a submerged dam across the south channel of the St. Lawrence River near Cornwall.

PETERBORO, ONT.—The Hydro-Electric Power Commission of Ontario is planning to construct a hydroelectric plant at Ranney's Falls, Campbellford, near Peterboro, to develop from 800 hp. to 10,000 hp. The cost is estimated at $1,250,000.

MONTREAL, QUE.—Plans are being considered by the City Commissioners for equipping one-half of the waterworks pumping station for electrical operation in order to comply with the demand of the Fuel Controller to reduce the consumption of coal.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Oct. 16, for copper cable and wire, electrical material, ceiling fans, repair parts for cars, etc. Blanks and information relating to this circular (1231) may be obtained at the above office or the office of the assistant purchasing agent, 24 State Street, New York City; 606 Common Street, New Orleans, La., and Fort Mason San Francisco, Cal.

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, J. P. Ross, Birmingham Railway, Light & Power Co.

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AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York City. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country.

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EASTERN NEW YORK SECTION, N. E. L. A. Assistant secretary, J. L. Hemphill, General Electric Co., Schenectady, N. Y.

ELECTRICAL CREDIT ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert E. Elliott, 502 Flatiron Building, San Francisco, Cal.

ELECTRICAL MANUFACTURERS' CLUB. Secretary, Shiras Morris, Hart & Hegeman, Hartford, Conn.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill. Meeting, Cleveland, Ohio, November.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Can.

ELECTRIC POWER CLUB, Secretary, C. H. Roth, 1410 West Adams St., Chicago, Ill.

ELECTRIC VEHICLE SECTION OF THE N. E. L. A. Secretary, A. Jackson Marshall, 29 West 39th St., New York City.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West 39th St., New York City.

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ILLINOIS STATE ELECTRIC ASSOCIATION. Secretary, R. H. Abbott, Petersburg, Ill.

Directory of Electrical Associations

Printed in the First Issue of Each Month

ILLUMINATING ENGINEERING SOCIETY. General secretary, Clarence L. Law. Sections in New York, Philadelphia, Pittsburgh, Cleveland, Chicago and Boston. Annual meeting Oct. 10.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donohue, Lafayette, Ind.

INDUSTRIAL ELECTRIC HEATING ASSOCIATION. Secretary, Homer Kunz, Toledo Railways & Light Co., Toledo, Ohio.

INSTITUTE OF RADIO ENGINEERS. Secretary Alfred N. Goldsmith, College City of New York, New York.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C le Maistre, 28 Victoria St., Westminster, London, S. W., England.

IOWA SECTION, N. E. L. A. Secretary-treasurer, M. G. Linn, Des Moines, Iowa.

JOVIAN ORDER. Jupiter (president), Henry J. F. Strickland, Dallas, Tex.; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo. Annual convention, Dallas, Tex., Oct. 14-16.

KANSAS PUBLIC SERVICE ASSOCIATION. Secretary-treasurer, W. W. Austin, Cottonwood Falls, Kan. Annual meeting, Kansas City, Kan., Oct. 17-19, 1918.

MICHIGAN SECTION, N. E. L. A. Secretary, Herbert Silvester, Detroit Edison Co., Detroit, Mich.

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NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, 33 West 39th St., New York City.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1350 Marquette Building, Chicago, Ill.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee, Ralph Sweetland, 141 Milk St., Boston, Mass.

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SOUTHERN CALIFORNIA ELECTRICAL CONTRACTORS AND DEALERS' ASSOCIATION. Secretary-treasurer, J. E. Wilson, 425 Consolidated Realty Building, Los Angeles, Cal.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 403-4 Slaughter Building, Dallas, Tex.

SOUTHWESTERN SOCIETY OF ENGINEERS. Secretary, C. E. Barglebaugh, 703 First National Bank Building, El Paso, Tex.

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VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, A. B. Marsden, Rutland, Vt.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 175 West Jackson Blvd., Chicago, Ill. Annual meeting, Chicago, Jan. 28-30, 1919.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, E. S. Nethercut, 1735 Monadnock Block, Chicago, Ill.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, J. P. Pulliam, 1408 First National Bank Building, Milwaukee, Wis.

Record of Electrical Patents

Notes on United States Patents

1,276,618. TUNING TRANSFORMER; Carlyle B. Campbell, Sully, Iowa. App. filed Feb. 16, 1917. Unused portions of the inductance are completely cut off from the circuit.

1,276,634. ELECTRIC LIGHT SOCKET; Joseph C. Forsyth, Brooklyn, N. Y. App. filed Feb. 24, 1917. Main body of the box may be detached from the head section thereof without disconnecting the current wires.

1,276,649. ELECTROPLATING APPARATUS; Forest H. Hartzell, Dayton, Ohio. App. filed Dec. 24, 1915. Means for facilitating the discharge of the contents of the cylinder or drum.

1,276,675. ELECTRIC SWITCH; Ezra B. Merriam, Schenectady, N. Y. App. filed Feb. 10, 1914. Circuit interrupted promptly.

1,276,682. DYNAMO-ELECTRIC MACHINE; Lewis W. Nelson, Niagara Falls, N. Y. App. filed Aug. 14, 1914. Employed in an automobile starting and lighting system.

1,276,714. ELECTRIC BATTERY; Raymond C. Benner, Fremont, Ohio. App. filed Feb. 7, 1918. Dry cells.

1,276,726. BRUSH HOLDER FOR DYNAMOS; John L. Creveling, New York, N. Y. App. filed Sept. 29, 1911. Current delivered by the dynamo to line will remain unidirectional regardless of reversals.

1,276,727. REVERSIBLE BRUSH HOLDER FOR USE WITH DYNAMOS; John L. Creveling, New York, N. Y. App. filed Dec. 26, 1911. For dynamos having rotors subject to reversals in direction of rotation.

1,276,737. ELECTRIC GAS LIGHTER; Roy F. Dowdy, Roanoke, Va. App. filed March 6, 1917. Novel construction of the handle.

1,276,739. MAKING MANGANESE COMPOUNDS; Carleton Ellis, Montclair, N. J. App. filed Oct. 27, 1916. For dry batteries of the Leclanché type.

1,276,754. ELECTRIC BATTERY; Walter Grothe, Fremont, Ohio. App. filed Feb. 5, 1916. Novel arrangements for supporting the electrode elements within the containers.

1,276,761. TELEPHONE-EXCHANGE SYSTEM; Edward E. Hinrichsen, New York, N. Y. App. filed May 22, 1917. Less apparatus is required in accomplishing the same result.

1,276,766. BURNED-OUT-LAMP REPLACER; Winthrop K. Howe, Rochester, N. Y. App. filed July 13, 1914. Burned-out lamp, particularly one of the kind used in railway signaling, may be replaced automatically by a perfect lamp.

1,276,767. CIRCUIT CONTROLLER; Winthrop K. Howe, Rochester, N. Y. App. filed July 3, 1916. For governing the operating circuits of automatic trips or similar signal appliances.

1,276,771. STORAGE BATTERY; Harold W. K. Dell, Edgeley, N. D. App. filed May 7, 1917. Positive and negative plates are formed of carbon.

1,276,772. TELEPHONE-EXCHANGE SYSTEM; Charles W. Keckler, Newark, N. J. App. filed May 24, 1917. Central-energy type.

1,276,783. LIGHTNING ARRESTER; John R. McFarlin, Philadelphia, Pa. App. filed July 14, 1917. Effectively prevents a following flow of line or dynamic current.

1,276,800. ELECTRIC FUSE; Elmer L. Ogle, Chicago, Ill. App. filed April 23, 1917. Number of parts reduced to a minimum.

1,276,804. ELECTRIC HAMMER; George M. Painter, Chicago, Ill. App. filed July 20, 1917. Impact member will move either slowly or fast, as desired.

1,276,827. SYSTEM OF ELECTRICAL DISTRIBUTION; Harry L. Tanner, Brooklyn, N. Y. App. filed Aug. 28, 1914. For use as a system of electric lighting for railway trains and automobiles.

1,276,856. METHOD OF MAKING COMMUTATORS; Vincent G. Apple, Dayton, Ohio. App. filed Feb. 14, 1918. The conducting bars of a dynamo-electric machine are made in one integral unit.

1,276,857. ART OF ARMATURE CONSTRUCTION; Vincent G. Apple, Dayton, Ohio. App. filed Feb. 14, 1918. Method of joining the terminal ends of armature conductors together and simultaneously to appropriate commutator segments or bars.

1,276,869. AUTOMATIC CONTROLLER; Guido E. Caglieri, San Francisco, Cal. App. filed Oct. 16, 1916. To be used in conjunction with the speedometer and the engine of an automobile.

1,276,911. CONTROL SYSTEM; Rudolf E. Hellmund, Pittsburgh, Pa. App. filed March 13, 1916. Motors may be accelerated in a smooth and uniform manner with favorable torque characteristics and with absence of commutation difficulties.

1,276,912. FIELD-CONTROL SYSTEM FOR SINGLE-PHASE COMMUTATOR MOTORS; Rudolf E. Hellmund, Pittsburgh, Pa. App. filed April 12, 1916. Maintains the strength of the main field at such values as to insure ample torque and good commutation under varying conditions of speed and of load.

1,276,913. SYSTEM OF CONTROL FOR SINGLE-PHASE COMMUTATOR MOTORS; Rudolf E. Hellmund, Pittsburgh, Harry E. Meyer, Wilkinsburg, and Andrew H. Candee, Pittsburgh, Pa. App. filed April 12, 1916. Enables a motor to be accelerated with ample torque and with favorable commutating conditions under widely varying loads and line voltage.

1,276,914. SUPPLY SYSTEM FOR PULSATING-TORQUE MOTORS; Rudolf E. Hellmund, Pittsburgh, Pa. App. filed May 20, 1916. Load may be driven with a substantially uniform torque by means of motors.

1,276,925. WATT-HOUR METER; Charles L. Inglefield, Midland, Pa. App. filed Dec. 15, 1914. Eliminates variable and uncertain element.

1,276,930. STEERING-WHEEL HAND WARMER; Charles W. Kemper and John T. Kemper, Oakland, Cal. App. filed April 17, 1917. Can be conveniently grasped to steady and turn the wheel while driving and to provide electrically operated heating elements.

1,276,934. ELECTRIC LIGHTING SYSTEM FOR AUTOMOBILES; Ernest W. Lane, Waverly, Iowa. App. filed July 26, 1918. Supplies a convenient means for switching lamps which are in series circuit with a magneto or other source of electric current into a multiple circuit with a source of electric current of lower voltage.

1,276,966. ELECTRIC LIGHT FIXTURE; Harry Rubin, Baltimore, Md. App. filed Aug. 31, 1917. Reflector and bowl constitute a two-piece electric lighting unit.

1,276,997. TELEPHONE SYSTEM WITH INSTANTANEOUS DISCONNECT AND RECALL; Thomas J. Tune, Cleveland, Ohio. App. filed Oct. 10, 1914. Instantaneous disconnect circuits.

1,277,003. X-RAY SYSTEM; Harry F. Waite, New York, N. Y. App. filed Oct. 18, 1917. For dental and similar work in which rotating parts are eliminated.

1,277,025. TELEPHONE AND TELEGRAPH CABLE; Gustavus A. Anderegg, Oak Park, and Wilbur E. Mougey, Chicago, Ill. App. filed June 30, 1916. Duplex cable.

1,277,042. DRY CELL; Charles F. Burgess, Madison, Wis. App. filed March 26, 1917. Obviates the expense and disadvantages of a soldered bottom.

1,277,044. INCLOSED ELECTRIC FUSE; Robert C. Cole, Hartford, Conn. App. filed March 28, 1918. Semi-refillables.

1,277,045. ELECTRIC FUSE LINK; Robert C. Cole, Hartford, Conn. App. filed March 28, 1918. Simple, cheaply formed and accurately calibrated link.

1,277,071. ELECTRIC PLUG; Harold P. Hastings and Lloyd C. Smith, Syracuse, N. Y. App. filed July 30, 1915. Simple and compact in construction.

1,277,078. IGNITION SYSTEM; John W. Jepson, Depew, N. Y. App. filed July 9, 1915. Has a battery and generating armature for feeding the ignition circuit and charging the battery.

1,277,091. TELEPHONE-EXCHANGE SYSTEM; Frank A. Lundquist, New York, N. Y. App. filed Dec. 2, 1916. Automatic switches are employed in extending connections from one line to another.

1,277,095. LIGHTNING ARRESTER; John R. McFarlin, Philadelphia, Pa. App. filed Oct. 26, 1916. Expulsion type.

1,277,101. MOTOR-CONTROLLED SWITCH FOR HEADLIGHTS OF AUTOMOBILES; Seth Mulvaney and Elmo L. Borner, Inglewood, Cal. App. filed Aug. 14, 1916. Used in connection with an automobile electric generator.

1,277,133. PROTECTIVE DEVICE; Roy G. Sands, Waukegan, Ill. App. filed March 19, 1917. Lightning arresters used for outdoor service in connection with telephone lines.

1,277,147. MULTICELL ELECTRIC BATTERY; Arthur V. St. Armande, Paisley, Scotland. App. filed Feb. 15, 1918. Consists in shrinking on to the cells a wrapper of insulating or waterproofing material as celluloid.

1,277,175. AUTOMOBILE SIGNAL; Robert C. Barfield, Salem, Ore. App. filed March 20, 1917. Operator of the automobile may readily notify the traffic in front and rear of the automobile in which direction a turn is contemplated or if a stop is contemplated.

1,277,223. ELECTRIC SWITCH; Franz Kratz and Gottlob Honold, Stuttgart, Germany. App. filed March 9, 1915. For internal-combustion engines on automobiles, motorboats and other moving vehicles.

1,277,225. SELF-STEERING BOMB; Hans Lausen, Wisdom, Mont. App. filed May 18, 1918. For automatically directing the projectile toward the object to be struck or bombed.

1,277,237. TIE CLAMP FOR INSULATORS; Theodore R. Mausen, New Brunswick, N. J. App. filed Aug. 2, 1917. One of the jaws moves bodily with respect to the other in both the clamping and unclamping actions.

1,277,249. OVERLOAD DEFINITE-TIME-LIMIT RELAY; Lloyd C. Nicholson, Buffalo, N. Y. App. filed Sept. 7, 1915. Will produce a certain definite motion in a certain definite number of alternations during which an overload current of greater value than a predetermined quantity remains in the circuit.

1,277,267. AUTOMATIC SPEED CONTROL FOR AUTOMOBILES; Arthur L. Skells, Henry, S. D. App. filed Nov. 12, 1917. Automatically cuts off the supply of electric current to the spark plug of an engine.

1,277,270. LAMP SUPPORT; Alexius Sunden, Coquille, Ore. App. filed Aug. 25, 1916. Object carried by the supporting stand may be adjusted in any desired direction and raised or lowered as required.

1,277,274. ARTIFICIAL-LINE-SELECTING SYSTEM; John F. Toomey, New York, N. Y., and Walter V. H. Read, Newark, N. J. App. filed March 31, 1917. Two-way two-repeater type wherein each transmission-line section is balanced by an artificial line.

1,277,303. AUTOMOBILE SIGNAL; Eugene Frey, Oakland, Cal. App. filed May 23, 1917. May be easily attached to existing vehicles and will be visible both from the front and rear.

1,277,304. METAL-PROTECTED HIGH-POTENTIAL INSULATOR; Bela Gati, Budapest, Hungary. App. filed July 22, 1915. Metal casing covering the insulation body projects beyond the insulation body, and the surface of the same not covered by the metal casing is formed in accordance with the principles of electrostatic strain.

1,277,321. METER PANEL; Hubert F. Krantz, Brooklyn, N. Y. App. filed Jan. 23, 1913. Means for contacting any selected meter bar while by the same movement contacting a contact member of opposite polarity.

1,277,348. IGNITION MECHANISM; Christian Aalborg, Wilkinsburg, Pa. App. filed Aug. 28, 1915. Usual separate devices of ignition system combined in simple manner.

1,277,360. LOCOMOTIVE OR CAR TRUCK; Asa F. Batchelder, Schenectady, N. Y. App. filed Jan. 14, 1918. Uses electric motors as part of mechanical portion.

1,277,365. VACUUM-TYPE CONVERTER; Wilfred T. Birdsall, Montclair, N. J. App. filed Oct. 9, 1915. Cathode blast interposed between two anodes subject to short-circuiting.

1,277,371. MOTION-TRANSLATING DEVICE; James M. Boyle and Fritz Reichmann, New York, N. Y. App. filed Jan. 9, 1914. Magnetism substituted for mechanical contact.

1,277,378. STERILIZING APPARATUS; Ralph E. Case, South Norwalk, Conn. App. filed March 13, 1916. Electrolytic cell controlled by quantity of liquid passing.